AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 7, No. 37. WEEKLY. | NEW YORK, SEPTEMBER 13, 1884. | $2.50 per Annum. SINGLE COPIES, 5 CENTS.

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The Blessing Globe Stop Valve and Check Valve.

Probably no single piece of steam fittings is, generally with good cause, found so much fault with as the ordinary globe valve, more especially in the smaller sizes. Such valves, when under steam of high pressure, even when made of the most suitable material, will, in time, leak, and when made of the cheap grades of so-called "steam metal" the length of time they will satisfactorily hold steam is extremely limited. If such valves must be removed from the pipe for renewal or repairs of the worn parts the waste and nuisance of leakage is generally tolerated until it becomes unbearable, as being on the whole a lesser evil than the trouble and delay incident to removal. For these reasons valves so constructed that the seats and disks can be renewed without disturbance to other parts, and without delay, are growing in popular favor; also for the further reason that these parts being light, as compared with the other parts of the valve, metal of superior quality can be used for them without materially increasing the cost of production.

Some such considerations as these have probably led to the design of globe valve illustrated herewith As will be seen, the seat is a simple ring, with a groove in its under surface for an elastic packing ring, and beveled on its slightly raised upper surface to correspond with the "ball" surface of the disk. This ring, or seat, is simply dropped into place, and is held by the bottom surface of the cage, which is cast in one piece, with the cap. When the latter is screwed to place the cage presses the elastic packing ring hard against the raised projection immediately underneath it, making a tight joint, the packing being securely held in place by the groove in the metal ring. By unscrewing the cap the seat can be removed and another one substituted without disturbance to any of the other parts, and without delay of any consequence.

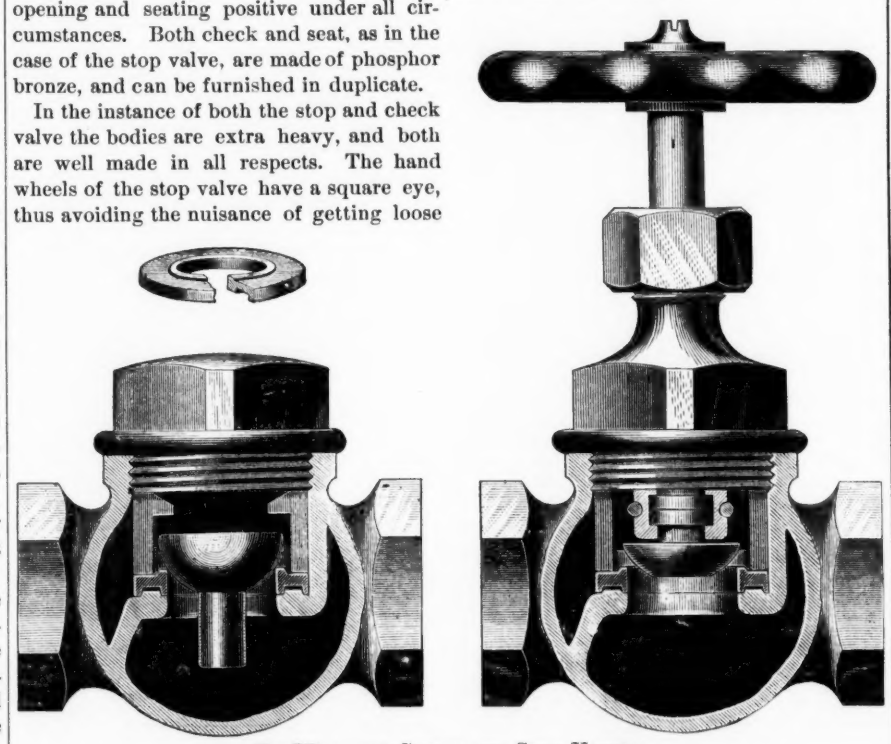
The disk is held on the stem by means of a split collar, clamped by a spring ring, and in such a way as to be free to adjust itself on the stem, and at the same time to be positively secure against accidentally coming off.

The renewable parts (the disk and seat) of all sizes of these valves are made interchangeable, and are furnished at small cost, when desired. When, however, repairs are needed, and these parts are not at hand, or it is not convenient to order them, they can be quickly turned up by a machinist out of any piece of metal large enough for the purpose. This advantage is appreciated in cases where valves are used in connection with chemical solutions with which it is advisable to use some other metal than bronze for seats and disks, as in such cases these parts can be turned up and substituted without further delay than about five minutes to make the change.

The disks and seats furnished are of phosphor bronze metal, which it has been demonstrated is especially adapted to the purpose, being little liable to channel or corrode.

The check valve shown has removable seat (shown in small broken cut at top), in all respects like the stop valve. The check, or valve, is a portion of a sphere with an extended stem at the bottom. This stem serves to balance the valve, but does not act as a guide, the construction being such that no close-fitting guide is required either at the top or bottom. This feature entirely avoids the liability to "stick," making the opening and seating positive under all circumstances. Both check and seat, as in the case of the stop valve, are made of phosphor bronze, and can be furnished in duplicate.

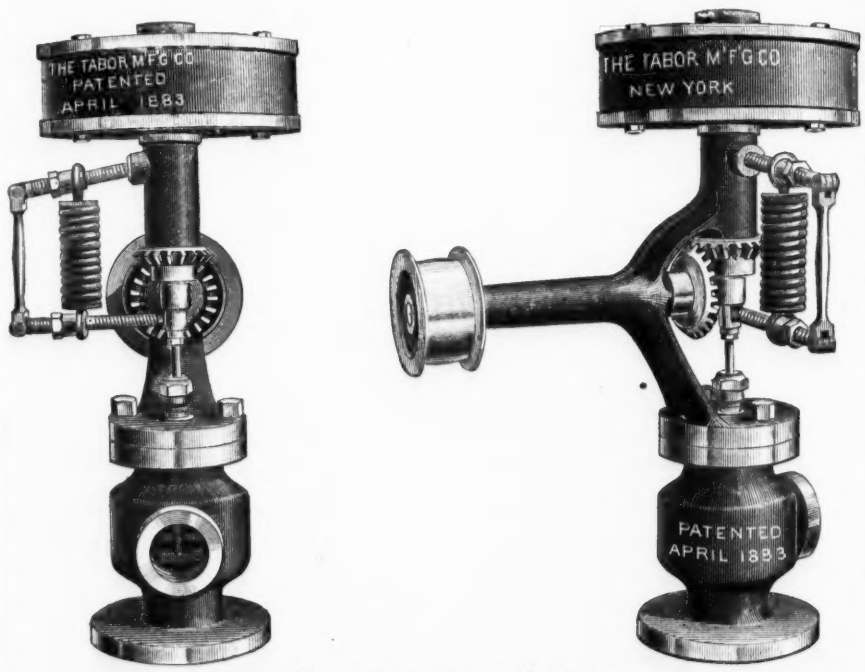
In the instance of both the stop and check valve the bodies are extra heavy, and both are well made in all respects. The hand wheels of the stop valve have a square eye, thus avoiding the nuisance of getting loose and turning around on the stem. They are manufactured by the Albany Steam Trap Company, Albany, N. Y.



THE BLESSING CHECK AND STOP VALVES.

The Tabor Steam Engine Governor.

The engravings represent two views of a new form of steam-engine governor, the invention of Harris Tabor, and manufactured by the Tabor Manufacturing Co., 111 Liberty Street, New York. This is a type of governor in which the operation of gravity is discarded, the centrifugal action of revolving weights being balanced by the resistance of a spring which furnishes the centripetal force. This particularly adapts it to be used, on traction engines, the jar of rough roads not affecting it as is the case where the principle of gravity is employed.



THE TABOR STEAM ENGINE GOVERNOR.

The weights which furnish the centrifugal force are pivoted in the case at the top, where they revolve at all times in the same horizontal plane, but at distances more or less removed from a common center depending upon the demands of regulation. A rod extends vertically and centrally down, through and below the case, and to the lower end of this rod the governor valve stem is attached, so that it may be lengthened or shortened for adjustment. Connection is made between the upper end of this rod (inside the case) and the weights in such a way that, as the latter move outwardly they depress the rod, thereby moving the valve in the direction to reduce the supply of steam to the engine. This action—the centrifugal force—which constantly tends to close the governor valve, is resisted by the single spring shown, as follows: The inner end of the lower of the two levers between which the spring is situated is suitably connected to the vertical rod previously referred to, while the inner end of the upper lever is pivoted to the governor stand: As the revolving weights thrust the rod downwards, it carries with it the inner end of the lower lever, which, in a manner that will be readily understood, distends the spring, the regularly increasing tension of which opposes itself to the downward motion of the rod in a degree substantially equal at all points to the varying centrifugal force due to the varying positions of the weights with reference to their neutral axis. Thus the centrifugal force of the weights, when in motion, is constantly tending to close the governor valve, and the centrifugal force of the spring as constantly tending to open it. Motion is communicated to the case and weights in the ordinary manner.

An Engine with ample fly-wheel, and otherwise well proportioned, can, if not overloaded, be so closely governed that it will be almost impossible to detect variation in speed, while an attempt to bring about the same approach to perfect regulation in an engine with a light fly-wheel would result in the wasteful use of steam without accomplishing the end aimed at. In other words, a governor that would be exactly right for one of these engines named would not be right for the other unless it was provided with some means of adjustment to suit the altered conditions. One end aimed at in the construction of this governor is the providing of these means, so that the same governor may be readily adapted to the requirements of any steam engine to which it may be attached, by anyone even unskilled in the art, and with no delay to the engine whatever. In constructing a spring governor a certain amount of initial tension is necessary for good regulation. It will be seen that the levers to which the spring is attached are set at a certain angle. This angle is such that it gives the correct spring tension for any position the spring may have on the bars, or speed levers, and thus will give the same approach to isochronal regulation for any speed within the range of the governor, which is about 90 per cent.

In the event of a light wheel a lesser approach to isochronal regulation must always be submitted to, and in such a case the tension on the spring may be reduced while the engine is running, and the position of the spring on the speed levers may be changed to make up for the loss of speed due to reducing the tension. On the other hand, when the fly-wheel is ample, and the closest possible approach to uniform running, under varying loads, is called for, as in the case of electric lighting, additional initial tension may be given the spring. The theoretical amount of tension necessary may always be found by taking the difference between the center of the vertical link, which connects the speed levers, and the distance between the bars where the link is attached.

The angle of the bars is such that when the spring is once adjusted for the load, a

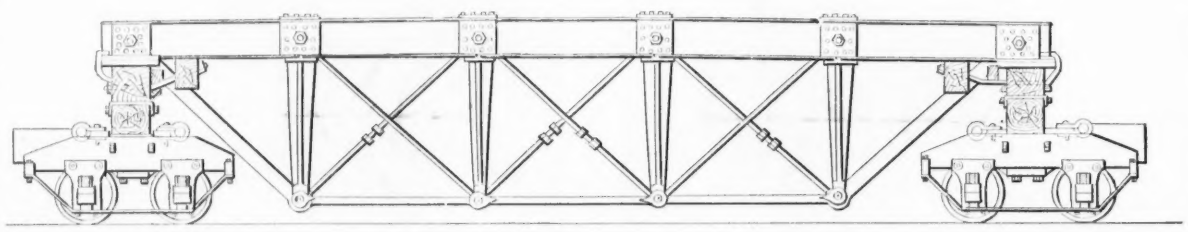
variation in either direction may be had by simply turning the nuts to which the spring is attached either out or in on their bars. It will be seen that not only a large range of speed is obtainable while the engine is running, but in addition the governor may be made more or less sensitive, to suit the fly-wheel conditions, at the will of the operator, while the engine is running.

The governor is well made, is of neat but unique appearance, and occupies but small space. A portion of the working parts are protected from dust by being inclosed in the case at the top. The parts are all simple and apparently durable, and can be easily renewed should it become necessary. The interchangeable system is adopted in their manufacture.

Some time ago a section of the Revised Statutes was framed, requiring all steam vessels to be equipped with gauges to indicate the pressure of steam, with suitable registers to correctly record each excess of steam carried above the prescribed limit, and the highest point attained. These Statutes contained a clause requiring that the recording gauge should perform its duty automatically and be beyond the control of the persons engaged in navigating the vessel. The Edson Steam Pressure Gauge Co., lately asked the Treasury Department to enforce the law, but as the Edson gauge requires winding up, it does not comply with this requirement, and the Board of Supervising Inspectors have declined to compel steamboat owners to use that gauge.

Moving Railroad Bridges on Car Trucks.

The annexed cut represents a plan devised and successfully carried out by Mr. C. Graham, Master Mechanic of the Bloomsburg Division of the Delaware, Lackawanna & Western Railroad, to move bridges from the shops where they were constructed to the locations where they had to be placed. Mr. Graham perceived that it would save a great deal of labor and expense if the bridges could be put together in the shops and transported whole. He tried the plan indicated, first for a bridge that had to be moved only a short distance, but he subsequently applied it to move bridges as far as 95 miles. As will be seen, the ends of the span rest on car trucks, on which means are provided for coupling the locomotive. When the bridge was drawn to its destination a derrick car was placed at each end, the opening cleared out and the span lowered into position on the abutments. The average speed made in conveying the bridges to their destination on the trucks was 15 miles an hour.



MOVING RAILROAD BRIDGES ON CAR TRUCKS.

The British Association.

The British Association, which opened a regular session in Montreal last Wednesday, is the most illustrious scientific body that ever met in America. So far as number of members is concerned, and their standing in the various walks of science, the British Association is the most influential scientific society in the world. The association was established in 1831 by a circle of liberal investigators, who proposed from the beginning that its purpose should be the general advancement of science. There were already many societies in existence for furthering special branches of scientific investigation, but in the British Association astronomers, chemists, engineers, metallurgists, naturalists, and representatives of other professions or lines of exact research, combined to help each other in the pursuit of knowledge. The leading scientists of Britain supported the association from the beginning, and the most eminent men in the country felt honored in devoting themselves to its service. A conspicuous trait of this society has been its liberality and the sympathy its members exhibited towards popular culture. Although its membership included many of the most aristocratic names in Britain, no scientific body had ever displayed equal interest in promoting scientific pursuits among the masses.

In carrying on its meeting work the association is divided into sections, each section devoting attention exclusively to the particular line of science it represents. The mechanical engineering section has always embraced the leading engineers in the United Kingdom, and the proceedings of this section are always interesting to the mechanical world at large. Many of the most eminent mechanical engineers of Britain will attend this Montreal meeting, and most of them will visit our most important engineering establishments before they return home. For these gentlemen we would bespeak a hearty welcome from the proprietors of the works they are likely to visit.

A candidate for public office, in the course of a political address, recently narrated the following:

What happened in Fall River a few years ago? The working men knew the mills were making money, and could not understand why their wages should be cut down, and they told the corporations so. The reply was that the cut-down was irrevocable. The working men struck. They proposed that the question at issue be submitted to three disinterested men to examine the books, and if the mills were not making money they would go to work at the cut-down; and if they were, then the employes were to be taken back at the old prices. Good men went to the mill officers and advised that the terms be accepted. But the mill officers would not accept the advice. It was afterwards proved that they could not show the books, because the majority of the treasurers were stealing money, and some are in State prison now. It would have been very much to the benefit of the capitalists and mill owners if there had been a tribunal that could have required the production of the books for examination. The stealing would have been stopped, and the working men would have continued to receive their old wages.

The Fast Locomotive of the Future.

BY F. VAN FLEET.

My subject is an attractive one to every master mechanic, and to all who are interested in the development of our rapid train service. It has engrossed the attention of every great railroad corporation in existence, and has elicited the deep thought and study of the best mechanical talent in the world.

It is, therefore, with caution that I approach this subject; for, where so many eminent mechanics have preceded, it would be presumption for me to assert superior knowledge. Hence, I do not claim that in what follows there is much that is original or novel, my object in writing this article being to indicate, in a general way, the lines of direction that improvements will probably tend in designing the successful fast locomotive of the future.

The enormous yearly increase of commerce and travel requires more rapid transit on our railroads. The public demand for an average speed of sixty miles or more per hour over long distances is one that must be met, and that, perhaps, in the near future.

Locomotives are common now that will run a mile or more per minute for short distances, but the engine has never yet been built that will maintain that speed for 100 miles or more over a good road-bed, and pull a moderately heavy train after it. That is what the future fast locomotive must do or be a failure.

The first great obstacle in designing a successful fast locomotive is to provide sufficient boiler capacity to furnish the necessary supply of steam to maintain a uniform speed under all circumstances. This calls for a reserve of power to be used on grades or curves, or wherever it requires more power to haul the train. Whether this can be supplied practically or not from a supplemental boiler placed either alongside the main boiler or on the tank, with flexible steam connections, is a question—said boiler to be much smaller than the main boiler, and to carry a high pressure of steam, say about 200 lbs. per square inch, with a throttle opening into the steam way of the locomotive. By this means the engineer can shut off his main throttle and open the secondary one, and have a fresh source of power to draw from and keep up the speed of his train, while the main boiler is recovering its pressure, if it is losing steam, or, when the steam pressure is equalized in both boilers, both throttles may be opened and the two boilers worked together in an emergency. I am aware that it will be somewhat difficult to locate the two boilers properly, and the throttle valves will require modification to enable them to stand back pressure without opening; but if the thing can be done at all, and it is not an impossibility, it may prove practicable and useful, for, when a fast train is losing speed on a grade, or through the boiler not steaming well, a second boiler, full of high-pressure steam, is a very handy thing to draw on, and would often determine whether the train makes time or not. However, this is a plan that can only be decided on its merits after practical trial.

Obviously, the best way to increase the efficiency of a boiler is to increase the heating surface to such an extent, and in such a way, that the water in the boiler will absorb the largest possible proportion of the heat generated in the furnace. The great enemy to the heat-absorbing power of the locomotive boiler is the sharp exhaust used to induce the necessary draft through the tubes to stimulate proper combustion in the fire-box; for, while it creates an intense heat in one end of the boiler, it, to a great extent, neutralizes this useful effect by drawing the heated gases through the tubes with such velocity that but a small portion of their heat can be absorbed in the passage. The exhaust, too, creates a back pressure in the cylinders that is very detrimental to maintaining high speeds. Both of these defects must be, in a great measure, done away with in future high-speed locomotives.

When locomotive boilers can be built with fire-boxes sufficiently large to furnish all the heat necessary for the service required, which need but little or no artificial draft to secure proper combustion, and with heating surface so arranged that the gases flow in a comparatively slow current to the stack, and when the exhaust pressure is reduced to a minimum, then we will have taken a long step in advance in locomotive practice. Just how this result will be accomplished cannot at present be predicted, but that it will eventually be successfully done there can be no doubt.

Another method of increasing the efficiency of locomotives is to carry higher steam pressure. The present pressure generally carried—from 120 lbs. to 140 lbs. per square inch—is too low for high speeds. High-pressure steam acts quick, and is usually dry. Low-pressure steam is slow in movement, and is more or less clogged with water or vapor. Nothing is so destructive to high speed as damp steam and water. At a mile a minute speed the piston speed is very high, and it takes the driest kind of steam, at a considerable pressure, to pass in and out of the cylinder quick enough to prevent injurious back pressure.

The tendency is toward higher pressure in locomotive boilers; and, with the increased use of steel in its construction, I do not think we can afford to stop short of 200 lbs. per square inch. It is simply a question of putting in heavier and better material, and making stronger boilers.

I have an idea that slightly decreasing the diameter of cylinders, and lengthening the stroke of fast locomotives, would be beneficial—say, make a 20x24 inch cylinder 19x28 inches or 18x30 inches. You get an increased leverage on the driving wheel by so doing which compensates for decrease of cylinder diameter, and gain more space for the steam to expand in cylinder, while the increased facility for exhaust steam to get out of the way of the piston, and thus decrease back pressure, is its greatest merit.

Parallel rods are the most troublesome thing about a locomotive to keep in order, and any method that will do away with them, without injury to the engine, will be welcomed by master mechanics and engineers. A plan has been proposed to lengthen the piston rod, and have two sets of guides and two connecting rods, one for each driver on a side in four-wheeled engines. It is doubtful if this will work well, as the twisting of the engine frame would throw the parts out of line and cause them to bind. This may possibly be gotten around by putting a universal joint in the piston rod just back of the forward cross-head. It is difficult to devise a substitute for the parallel rods, and, therefore, they must be endured until something better can be conjured up.

The hardest thing on the fast-running engine of the present day is the unequal swaying, jolting motion produced by the steam acting on the crank-pins, placed quartering instead of opposite each other. Bad counterbalancing of drivers is also a fruitful source of pounding and vibration. It is these evils that knock an engine all to pieces, and require such constant adjustment of wedges, setting up of keys, and taking up stack nuts, bolts, etc. To do away with this vibration, it has been proposed to use double cylinders on each side, with two connecting rods taking on two crank-pins, placed exactly opposite each other, on the main driving wheel of each side. Another method is to use one large inside cylinder, placed under the smoke-box, and connecting with a double crank between the drivers, and two small, outside-connected cylinders, of half the diameter of large inside cylinder, connecting with crank-pins on outside of driving wheels, placed exactly quartering the throw of double inside crank, and in same relative position to each other. These plans will, no doubt, increase the steadiness of the engine, but it is at the cost of increased complication. But the time may come when a little extra complication may not be objected to when the desired result can be obtained.

In regard to valve motion, I have but little to say; the subject has been written threadbare. It may be possible to design a better valve motion than the ordinary link, but until it is done, and proven superior in practice, I shall not believe it. Under all circumstances of duty and ease of manipulation, the link has proven the sturdy friend of the engineer, and it will be long before a successful rival will supplant it.

It is doubtful if a larger driving wheel than 6 feet 6 inches can ever be successfully used on American railroads, owing to the heavy trains hauled and the steep grades and sharp curves encountered on most of our roads. In practice, a six-foot wheel is better, if it can be turned round fast enough, than a seven or eight-foot driver for fast running. The slippage of the smaller wheel is not so great; it has more tractive force—does not leave the rail so readily and curves easier. Large wheels are only good for straight roads, large curves and light grades, which, from the nature of this country, with

its numerous hills and serpentine streams, is almost impossible to secure.

Until road-beds, bridges and cars are reconstructed and greatly strengthened, it would seem to be useless to build heavier locomotives than we have at present, for their capacity is far beyond the strength of car couplings, frames and road-beds to stand the wear and tear occasioned by their use. If we want higher speeds than are at present attained, we must strengthen and straighten our railroads, cut down the grades, use a highly-improved and not too heavy locomotive, and run more numerous and comparatively lighter trains than is now done. Until these conditions are obtained, it is doubtful if we can look for any great increase of average speed in long runs on the railroads of America.

Eclipse Power Pipe Cutting Machine.

The engravings represent a new machine for cutting off and threading pipe, manufactured by Pancoast & Maule, 243 South Third Street, Philadelphia. As will be seen, this is a very compact machine, occupying but little floor space. It is fitted with an automatic oil pump, which is supplied from a reservoir in the hollow base. From this the pump keeps up a constant flow of oil to the cutting head, the oil returning to the reservoir to be used over and over.

The gripping chuck is placed at the back instead of the front end of machine, it being claimed that by increasing the distance between the head and the chuck, straighter threads are cut than if the pipe is gripped close to the thread, especially when, as is quite apt to be the case, there are slight bends or kinks in the pipe. The chuck is easily accessible, and is very conveniently used as a vise for screwing on or removing fittings.

The machine is powerfully geared, only a 3″ belt being required for cutting 4″ pipe.

It is not necessary to reverse the motion of machine for cutting off pipe, the knife being reversed, thus permitting the oil readily to reach the cutting edge, instead of being carried away with the chips.

The machine is simple, and all parts easily come at. The one here represented, No. 2, cuts off and threads pipe from 1″ to 4″, inclusive, using ordinary solid dies from 1″ to 2″, and cutter dies from 2½″ to 4″. It has three changes of speed to accommodate different sizes of pipe. The countershaft has pulleys 12″ diameter. The total weight of machine and dies, countershaft not included, is 1,070 pounds; floor space required, 30″x42″.

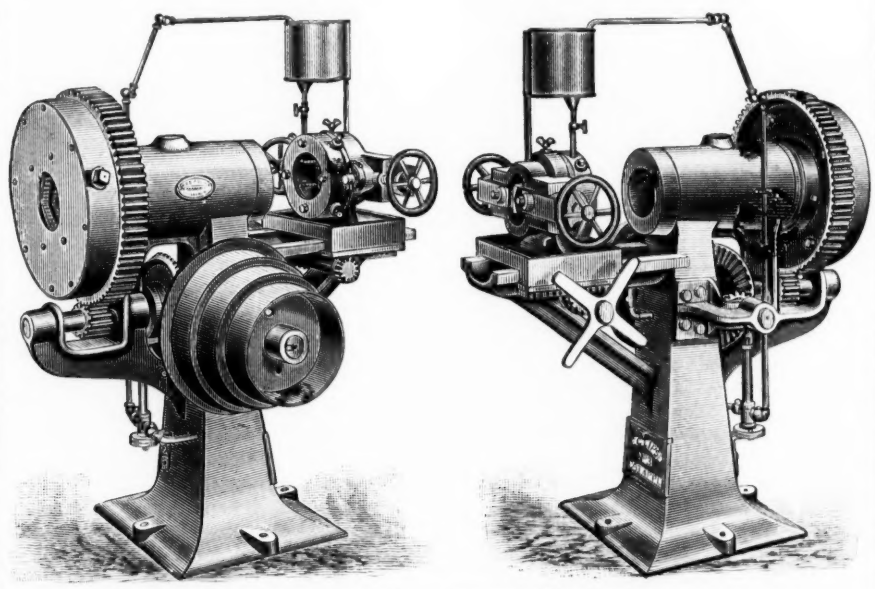
The *Northwestern Lumberman*, in an article combating the prevailing idea that, after the lumbermen get through with the northern pine regions the land is worthless, says:

But after the pine owner and his one idea have passed away, the country will still be rich in resources—will still be a timbered area, abounding in the raw material for multifarious manufactures. These pine-headed men should take a tramp over the State of Maine, and of New Hampshire, and other New England States, and a part of New York as well, to find out how much can be made out of the forests after the saw-log pine has been cut off. It is vain to attempt to enumerate the articles of use that are made out of our common forest woods. A few are these: Furniture; cooperage of all sorts, including that for tubs and pails; wagon stock; handles for probably hundreds of purposes; woods for all kinds of carpenters' and other tools; lasts for shoes; baskets in great variety; crates and fruit boxes; woodenware, including many articles; hand rakes; curtain rollers; druggists' boxes, turned and square; spools; bobbins; toothpicks; paper pulp; excelsior; bark for tanning and medical use, etc., etc. All these things can be manufactured out of the woods in the forests of our northern belt, and will be as soon as capital has disposed of the bulk of the pine in the coarser processes of manipulation. As the forest portion of the Northern States becomes older and more thickly inhabited, new branches of wood manufacture will be undertaken, a finer manipulation will be sought and reached. Nearly every hamlet and village will have one or more wood manufacturing establishments, and the surrounding forests will be made to pay tribute in various forms to local wealth. While a multitude of manufacturing centers will thus be built up, the way will be paved for success in agriculture, even on poor soil. Home markets will be supplied in the manufacturing centers—markets that will demand fruits, poultry, garden truck, and those food products that can be grown profitably on small farms by careful husbandry. It is in this way that the pine regions will one day support a thrifty, intelligent, and wealthy population.

Importance of Tin.

It seems curious, considering the metallurgical opulence of the American continent, that we continue to be dependent upon English mines for nearly our entire consumption of tin. Every few months lately we have been served with reports intimating that tin ore in paying quantities has been discovered in various localities in the States, and those interested in the new mines are going to revolutionize the tin trade directly, but somehow the reports and promises appear to end in nothing. The price of tin rules so high, being about four hundred dollars a ton, that it offers rich encouragement to any one who may discover good ore, but the search continues to be fruitless. Tin in small quantities has been found over a wide area, but the market is principally supplied from Cornwall, in England; Banca, in the East Indies, and Malacca, in South Asia. Tin is a metal that has performed a most important part in the world's history. Combined with copper to form bronze, it was doubtless one of the first metals brought into the service of man, and implements and weapons constructed from this alloy were used during a much longer period than iron or steel have yet served art or war.

The bronze of the Greeks and Romans consisted of about five parts of copper to one of tin—a proportion which produces an alloy of the greatest hardness. The men who worked the metals in those early times must have attained great skill in the manipulation of alloys, for they were able to harden bronze articles so that a good cutting edge could be held. The necessity which the old Eastern civilization had for tin first brought the British Isles into note, for tin was obtained from Cornwall long before the Christian era. Herodotus, who wrote 450 years B. C., is supposed to refer to Britain under the name of Cassiterides, which name is similar to the Greek word for tin. The alloys which are found with tin were comparatively easy to work, and they gave early races tools, the great aid to the development of civilization long before the science needed to refine iron ores was reached. The skill that was acquired by the use of even crude bronze tools led the way into more difficult lines of metal working. It seems questionable if the world would ever have reached the iron and steel epoch if the chasm between it and the stone age had not been bridged by the bronze age. In a later period tin greatly accelerated the wheels of progress by providing the necessity which brought the practically successful steam engine into existence. The long-continued demand on Cornwall to supply tin to the world, from the times away back into mythical antiquity on to modern days, had, by the beginning of the eighteenth century, sent many of the mines away far down into the bowels of the earth. There, though tin ore was plentiful, water was more so, and the means of draining the latter out were so crude that proprietors of rich mines had to abandon their property because they could not keep out the water from the workings. When the primitive form of atmospheric engine was first brought into use, it would have continued a mere experiment—a toy for the disquisitions and experiments of learned theorists—had pumping Cornish mines not given it profitable practical work to do. No kind of work could have better fitted the Newcomen engine than pumping water, where regularity of motion was of no great consequence. While doing this sort of duty, opportunities were given for improving the machine as experience dictated. But for the teaching received from the rough atmospheric engine constructed by Newcomen, Watt would have had no use for a separate condenser for his great invention, and Oliver Evans could have invented no high-pressure steam engine for want of the train of mechanism that formed the steam engine. Putting a non-oxydizing covering on pans and dinner buckets is an important purpose of tin, but the metal has done many more heroic services to the human race.



ECLIPSE POWER PIPE CUTTING MACHINES.

A Rising Machinist.

A correspondent in Columbus, Ga., has directed our attention to an ingeniously-contrived, oil-tight axle-box for railroad cars, invented by Mr. John C. Albright, at the same time giving us a few biographical particulars regarding the inventor, which indicate that Mr. Albright may be regarded as one of the rising mechanics of the South. After serving his apprenticeship as a machinist in the Muscogee Iron Works, Columbus, Ga., Mr. Albright obtained work as a journeyman in the machine shops of the Mobile and Girard Railroad Co. Here he worked for some time till the master mechanic was killed in an accident, when this young machinist was appointed to fill the position. So satisfactorily has he performed the duties devolving upon him that last year he was appointed to the position of master mechanic of the combined shops of three roads running into Columbus. Mr. Albright is still under forty years of age. Such men as Mr. Albright are going to be the leaders in the New South, whose prosperity will be built on diversified industries.

A correspondent of a Boston paper, writing from Savoy, Italy, is intensely interested in the primitive manners of the peasantry. He is enamored of the poetic surroundings of this new Acadia. "I am struck," says this writer, "with the simplicity of the agricultural arrangements. Two women, driving cows with a stick, do almost the whole work of one of these small proprietors. A very primitive plow and the ground but imperfectly harrowed. The cows and the women are none the worse for the labor. I have seen the most delightful subject for water-color sketches: A peasant woman with her baby in her arms, an immense bundle on her head; straight and beautiful she walked along." Worshipers of art may see much to admire in women being turned into beasts of burden, but we hope that the American continent will be kept free from such spectacles.

The *Railway Age* says of the new western connection of the Chesapeake & Ohio Railroad, now nearly completed:

Between Baton Rouge and New Orleans, on the Louisville, New Orleans & Texas Railroad, a distance of eighty-nine miles, there are eighty side tracks, or one for every sugar and rice plantation. These side tracks are put in for the convenience of planters. The railroad company will put cars on side tracks, which will be loaded by planters and their bills of lading taken. Above Vicksburg the same plan will be worked as to cotton plantations, and a side track put up at every gin house.

Art's Hatred to Utility.

Mechanical structures generally, but more especially railway works, exercise the same influence on the ordinary artist's mind that a scarlet rag does on the temper of a bull. Hatred of all works of utility is a prevailing sentiment among all small-fry artists of the caliber that lacks the originality necessary to harmonize usefulness and beauty. Yet Turner, one of the greatest of modern artists, made use of a railway train in one of his masterpieces; but few that came after him have been able to free themselves from the snobbish traditions of their craft and acknowledge that the mighty force engines, that have raised mankind from brutes of burden to the position of rulers in nature, furnish types of beauty worthy of the artist's brush. The leader in the fashion that abuses utility in season and out of season is the able but erratic and ever caustic Ruskin. His latest tirade is a lecture on English art, wherein he devotes long scolding attention to the deteriorations of noble subjects induced by the progress of manufactures and engineering. He says: "Four of the most beautiful and picturesque subjects once existing in Europe—Furness Abbey, Conway Castle, the Castle of Chillon, and the Falls of Shaffhausen—a railroad station has been set up within a hundred yards of the abbey; an iron railroad bridge crosses the Conway in front of its castle; a stone one crosses the Rhine at the top of its cataract, and the great Simplon line passes the end of the drawbridge of Chillon. Since such improvements have taken place, the portraiture of these scenes by men of sense or feeling has become forever impossible. Discord of color may be endured in a picture—discord of sentiment never. The artist turns unconsciously, but necessarily, from the disgraced noblesse of the past to the consistent baseness of the present; and is content to paint whatever he is in the habit of seeing in the manner he thinks best calculated to recommend it to his customers." It seems dreadful that unmannerly engineers should erect bridges and build railroads to jar the sensitive feelings of the modern nobility of art. It is a pity these pessimists could not all be turned together on some island, where machinery was banished and man alone made the sole beast of burden. There they would find nature in its virgin purity! There would be their Utopia!

Taxing Engineers for the Benefit of Policemen.

A test suit has been brought in New York City, designed to settle the question as to the right of the Board of Police Commissioners to tax stationary engineers $2 a year by way of license fee, and turn over the money thus raised to the Police Pension Fund. As we understand it, competent men who run stationary engines are not likely to object to any system of examination and license which is calculated to raise the standard of capacity and fitness in that line of employment, and probably as little objection would be made

to the requirement of a license fee sufficient to cover the cost of such examinations. But exactly why a fund, raised by means of an exaction levied upon stationary engineers, should be diverted to benefit decayed policemen, is one of those things that hardly any fellow can find out.

Inertia of the Reciprocating Parts of the Steam Engine.

By Ed. F. Williams.

THIRD PAPER.

The velocity of the piston of a steam engine is due to two movements of the crankpin. One of these movements is that in the direction of the piston's motion, and the other that at right angles to this motion. When the crankpin is on the center, as at c, Fig. 1, the crosshead pin (with which the piston travels at all times) is at p. While the crankpin travels from 0° to the 90° angle at c'', its horizontal movement is from c, to $c'=P$, to P'. The pin has moved upward also, the height $c\,c''$ and in doing so has moved the piston the distance $P'\,P''$; so in the first quarter revolution the piston has moved the distance $P'\,P''$, which will be found equal to the one-half stroke plus the versed sine of the angle of connecting-rod, the length of the connecting-rod being taken as unity or radius. During the passage of this quadrant the relative velocities of piston and crankpin are varying, the piston having but little motion near the beginning of the stroke, and increasing until a point is reached by the crankpin more or less distant from 90° (according to the length of connecting-rod relatively to that of the crank), at which point the piston velocity is actually greater than the tangetial velocity of crankpin. From this position the velocity decreases until the 90° angle is reached, when piston and crankpin are traveling in parallel lines, and their velocities are equal. While the crankpin moves from c'' to d' the piston moves the distance $d\,d'$, which is the one-half stroke minus the versed sine of angle of connecting-rod (when crank is at 90°), the length of the connecting-rod considered as unity or radius. When the crankpin reaches d', all motion of the piston ceases. During the passages of the 2d quadrant the relative velocities of crankpin and pistons are varying, as in the 1st quadrant. These variations are the same for the 3d quadrant as for the 2d, and for the 4th as for the 1st. The mean velocities during the 1st and 4th quadrants are equal, and are greater than those of the 2d and 3d, which are relatively to each other the same also. To use a common expression, the velocity of piston is greatest on the back end. For this reason inertia is greatest on the back end. This explains the curved form of the inertia line drawn by the inertia instrument, as presented in a previous paper, and this is one of the evidences of the truthfulness of the instrument. The curved form of the line is caused by the angularity of the connecting-rod, which obliges the piston to travel fastest on the back end, developing more inertia there and causing the point of highest velocity to be reached before the half-stroke is arrived at. By this action the inertia line begins at a greater distance from the neutral line on the back end than on the front end and crosses the neutral line, as it must, at the point of highest velocity, which point is not at half-stroke, as represented by John W. Nystrom, in the American Machinist, August 30th, but is more or less distant from the back end, according to the ratio of connecting-rod to crank. These facts show that the true inertia line or diagram must be a curve, and is not an "error probably caused by the inertia mass," as surmised by Mr. Nystrom. It is a curve mathematically considered, and is drawn a curve by the inertia instrument. The point of highest velocity is at f, when the crankpin is at e, and the connecting-rod tangent to the crank circle. Acceleration or increment of motion is greatest at the beginning of the forward stroke, and gradually diminishes until the highest velocity is reached. After this it changes to a gradually increasing retardation or diminution of motion, which becomes greatest at the very ending of the forward stroke. Then, during the backward stroke, acceleration takes the place of retardation, and retardation the place of acceleration. That is to say, the positive and negative signs are reversed by a reversal in the direction of the piston's motion.

In Fig. 2 the space a, represents acceleration during the forward, and retardation during the backward stroke; likewise, b represents retardation during the forward, and acceleration during the backward stroke. The line $y\,y'$, is the inertia line, and x, x', is the neutral line, and where $y\,y'$ crosses $x\,x'$

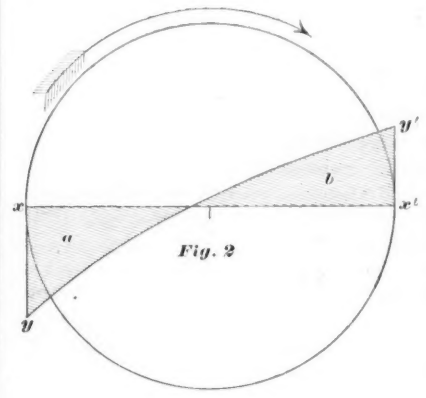


Fig. 2

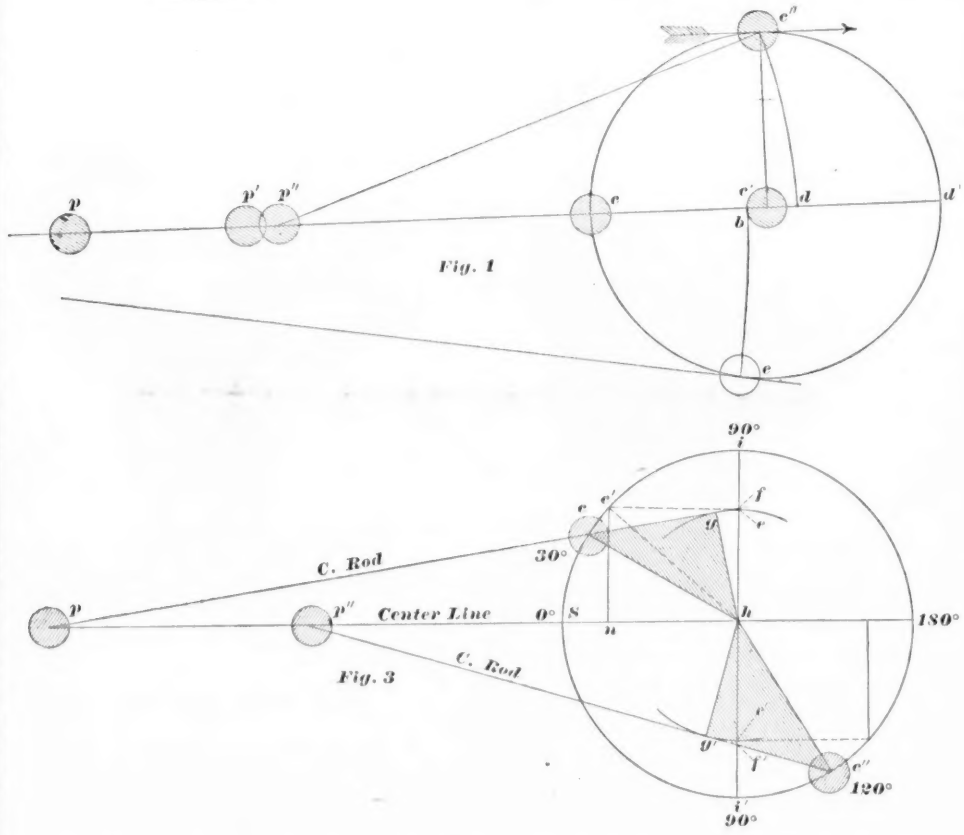


Fig. 1

Fig. 3

there is neither acceleration nor retardation, consequently no inertia. It will be seen by referring to this diagram that acceleration and retardation are greatest on the back end, and that the one ceases before the half stroke is reached on the forward motion, and the other begins after the half stroke is passed on the backward motion. The area a=area b, so that during either stroke the power required to overcome inertia during acceleration is given out again during retardation, and there is no loss of power by the existence of inertia, supposing the machine to be frictionless. Acceleration and retardation are greatest at the very beginning and ending of the stroke, where velocity is least, and it must be borne in mind that they are distinctly different from velocity.

To find the velocity of the piston, either relatively to that of the crankpin or absolutely considered, I will refer to Fig. 3. When the crankpin is at any position, as c, the velocity of piston is to crankpin velocity as $h\,f$, is to $h\,i$, or radius. The line $h\,f$, is the secant of angle of connecting-rod, the sine of crank angle plus connecting-rod angle considered as radius. Then, to find the velocity of piston: Multiply the sine of crank angle plus connecting-rod angle (or the sine of 180° minus this sum when it exceeds 90°), by the secant of connecting-rod angle, and the product is the velocity of the piston relatively to that of the crankpin, and the actual velocity is the product of the tangetial velocity of crankpin into this number.

Let S=sine of crank angle plus connecting-rod angle, or the sine 180° minus this sum measured from the back center.

S′=secant of connecting-rod angle.

V=velocity of crankpin in feet per second.

V′=velocity of piston in feet per second.

V″=velocity of piston relatively to that of the crankpin.

(6) $\quad V'=(S\times S')\,V$

(6a) $\quad V''=S+S'$

The reasoning of this is as follows: Referring again to Fig. 3, the pin at any position, c, $g\,h$, is the purchase of a force acting along the line of connecting rod, and as velocity is in direct proportion to purchase, $g\,h$, represents the velocity in that direction, and is equal to the sine, $c'\,n$, of the crank angle, $c\;h\;s$, plus connecting-rod angle, $c\;P\;s$, or $g\;h\;e$, which sum is equal to the angle, $c'\;h\;s$. Conceive the triangle, $c\;h\;g$, to be revolved about h as a center until $g\,h$, coincides with $e\;h$; then the angle $c'\;h\;s$ will equal crank angle plus angle $g\;h\;e$, which can be proven equal to angle of connecting-rod, and as $c\;g$ is at right angles to $g\;h$ (being tangetical to $g\;h$), the latter will be equal to the sine $c'\,f\,n$ of crank angle plus connecting-rod angle. The piston velocity along the center line is as much greater than $g\,h$ as $h\;f$, or secant, is greater than $h\,e$, or radius. When the crank angle, plus connecting-rod angle, measured from the back center at S, exceeds 90°, take the sine of 180° minus this sum.

EXAMPLE:

Crank angle, 85°; connecting-rod angle, 10°; sum, 95°; 180° − 95° = 85°, which is the angle whose sine must be taken. Referring again to Fig. 3: The crank-pin in any position, as c'', forward of the half stroke, its velocity relatively to that of the piston is as $h\;i$, or radius, is to $h\;f$, or sine of 180° minus angle of crank plus angle of connecting-rod, multiplied by the secant of angle of connecting-rod.

EXAMPLE:

Crank angle, 120°; connecting-rod angle, 10°; 180° − (120 + 10°) = 50°; sine of 50°, .7660; secant of 10°, 1.0154; .7660 × 1.0154 = .7777, which would be the velocity of piston, that of the crankpin considered as unity.

To find the connecting-rod angle when the crank angle and ratio of connecting-rod to crank are known: Divide the sine of the crank angle by the ratio of connecting-rod to crank, and find in table the arc corresponding to the quotient taken as sine of new arc.

EXAMPLE:

Angle of crank, 30°; ratio of connecting-rod to crank, 6. Sine of 30°, .5000, and .5000 ÷ 6 = .0833, corresponding arc, 4° 47′, which is the connecting-rod angle.

We are now prepared for formula 7, by which to obtain the mean inertia force per square inch of piston area for any interval of the crank circle.

Let T = time required in seconds for the crankpin to pass through that interval.

R = area of piston divided by its weight, or weight ratio. Then

(7) $\quad \dfrac{(S\times S')\,V}{32.166\times T}\times R =$

mean force per square inch of piston's area. An excellent table of natural trigonometrical functions will be found in "Nystrom's Mechanics."

The foregoing principles being well understood, we have the groundwork for future investigations. I have endeavored to give in as plain language as possible the underlying principles of inertia and velocity, which will be of future use in these writings, briefly reasoning all the subjects, and at the conclusions boiling down into simple formulæ.

I have chosen the most direct road known to me to the object sought. It is not mathematical flourish that is wanted in an investigation of this nature, but a careful study of the facts. It is the writer's object to get at the real condition of inertia in the steam engine, hoping to turn this knowledge to useful account in the future. When all the mathematical clouds are cleared up, we may then approach the real subject—the object of these studies—namely, the investigation of the effects of inertia in the steam engine.

Safety Device for Elevators.

William J. M. Dobson, of New York City, has patented a safety device for elevators, consisting of a metallic tube or cylinder in which a piston is arranged to move freely. This piston has holes through it in the direction of its length, and a disk on top which fits the piston around the periphery. This disk, which is really a valve, has through it holes of less area than those through the piston. The piston is attached to the car by means of a wire rope, and moves in a contrary direction to the car, but a less distance. The cylinder is filled with fluid, and the holes through the piston are of such number and diameter that at ordinary speed the fluid will readily pass from one side to the other, in hoisting the valve at top of piston lifting to permit freer escape. Should the hoisting rope break, the valve closes and the room for the passage of fluid from one side of the piston to the other is so restricted that the car will descend with only about its ordinary velocity. The piston can, when desired, be made to serve as a counter-weight to the car.

Fifth Annual Meeting of the Mechanical Engineers.

Announcement is made that the fifth annual meeting of the American Society of Mechanical Engineers will be held in the city of New York during the week beginning November 2, 1884. Detailed programmes will be sent out as the date draws nearer.

How a Lady Identified a Machinist.

A machine manufacturer, residing in Pennsylvania, sends us the following:

"A few months ago a lady friend of my wife's was coming on to visit us. I was to meet her on the train leaving Philadelphia at 4.55 P. M. We had never met before, and had not even seen each other's photographs. My wife gave me as good a description of her friend as she could. I failed to find the lady, but she found me. Surprised at her knowing me, I asked her about it, whereupon she showed me a letter from my wife to her, which I quote: 'Walk carefully through the

train, and if you find a lanky individual reading the AMERICAN MACHINIST, and having a Brown & Sharpe catalogue sticking out of one side pocket, and a Pratt & Whitney catalogue sticking out of the other side pocket —that is him, every time!' I think this is too good a joke to keep."

American Association for the Advancement of Science—Section D.

The following is a list of the papers which have been definitely proposed for the mechanical section of the A. A. A. S. at the approaching meeting in Philadelphia, the authors reserving the right to revise or supply the titles:

Annual address by President R. H. Thurston.

Two papers by Prof. W. A. Rodgers, of Cambridge, Mass., in connection with his work on standard bars, screws, etc.

On the "Manipulation of Optical Surfaces," J. A. Brashear, Pittsburgh, Pa.

"The Economy of the Electric Light," A. Stirling, New York city.

"The Giant's Causeway and Port Rush Electric Tramway," with working model of the same, W. A. Truitt, Portrush, County Antrim, Ireland.

"Three Problems in River Physics: I. Sediment *vs.* Sand Bars; II. Flow of Water in Natural Channels; III. Relation of Levees to Floods and Low Water Navigation," J. B. Johnson, Washington, D. C.

"Belting," Gaetano Lanza, Massachusetts Institute of Technology.

"Methods of Teaching in Mechanical Engineering," Geo. J. Alden, Worcester Free Institute.

"The Strength of Cast Iron," W. J. Millar, Glasgow, Scotland.

Other papers by prominent gentlemen are expected but not announced.

It is suggested that several sessions be devoted to papers on special subjects and discussion upon the same, and the following subjects may be mentioned as likely to prove of sufficient interest for at least one session a piece:

1. "Standard Bars, Screws, Surfaces, etc., and their Importance in the Construction of Machinery". 2. "Modern Applications of Electricity From a Mechanical Standpoint." 3. "Problems in Civil Engineering." 4. "Methods of Teaching Mechanical Engineering in Technical Schools."

Those gentlemen who are interested in the above subjects are requested to come prepared to take active part in the discussions, and suitable papers on any of the above subjects will be especially welcome.

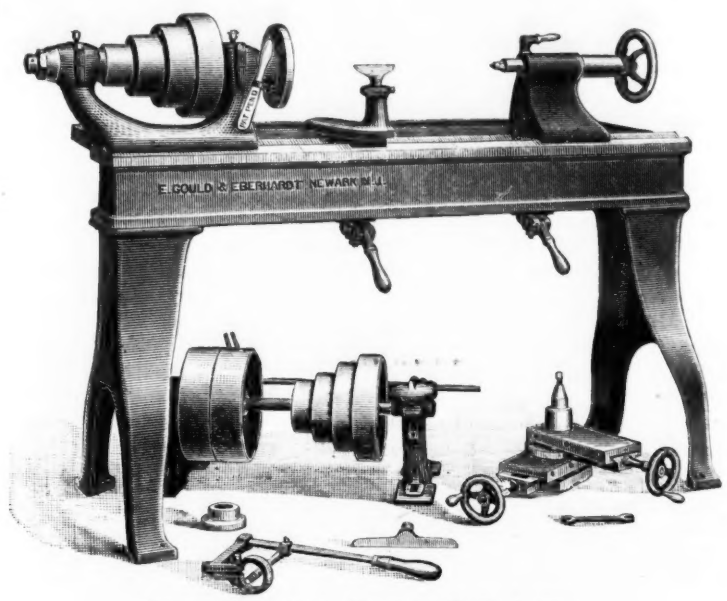
Abstracts, and especially titles of papers, should be sent as soon as possible to Permanent Secretary Prof. F. W. Putnam, Hotel Lafayette, Philadelphia. Space has been provided for models and apparatus, and attention is directed to the reduced rates for their transportation, to and from Philadelphia.

J. BURKITT WEBB,
Secretary Section D.

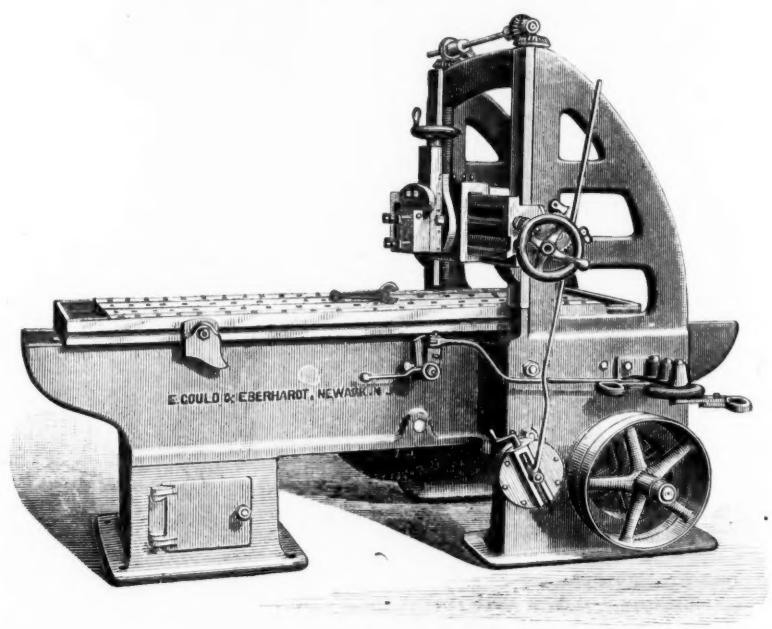
Ithaca, N. Y., Aug. 20, 1884.

Street car lines are not very numerous in Mexico, but they have been introduced into some of the larger cities, and the method of operating is somewhat original. Cars are not run at stated intervals, but are held at terminal points till passengers enough congregate to fill two or three cars; then the cavalcade starts out, and all keep together. This leaves wide intervals, which are utilized by hauling cars loaded with merchandise, cars for cleaning the streets, and even cars to move funerals to the cemeteries.

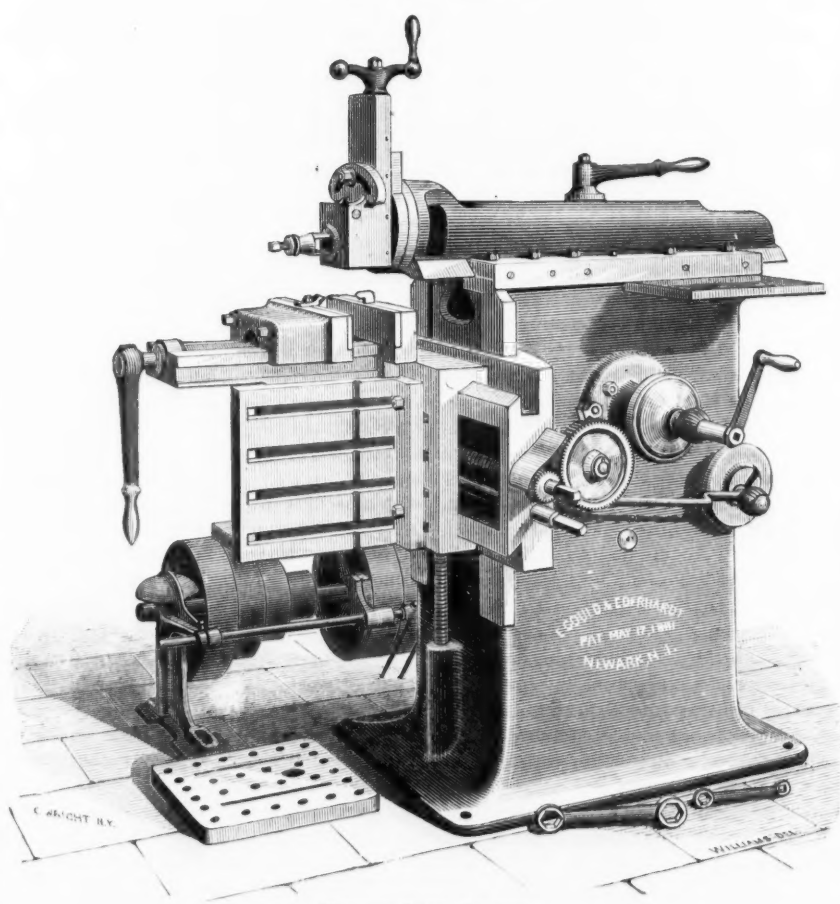
All carpenters know how soon the butt ends of chisel handles split, when daily exposed to the blow of a mallet or hammer. A remedy, suggested by a Brooklyn man, consists of simply sawing or cutting off the round end of the handle so as to make it flat, and attaching, by a few small nails on the top of it, two round disks of sole leather, so that the end becomes similar to a boot heel. The two thicknesses of leather will prevent all further splitting, and if, in the course of time, they expand and overlap the wood of the handle, they are simply trimmed off all round.—*American Lumberman.*



SIXTEEN-INCH QUICK-STOPPING HAND LATHE.



TWENTY-FOUR-INCH PLANER.



FIFTEEN-INCH SHAPER.

There are still living two pioneer boatmen of the Mississippi River, who saw the original boats of Fulton and Livingston, and began work while they were in use. Captain Louis Choate, who is now living in New Orleans, and Captain Isaac Wright, who lives in Troy, Ind., both began boating between Cincinnati and New Orleans in 1818. Both the old boatmen are fond of narrating their stirring adventures on the river in the days when the country on the banks was mostly inhabited by savage Indians. The penalty of running a boat ashore in those times was the scalps of all hands, and it was promptly claimed by the Indians.

New Machine Tools by Gould & Eberhardt.

The engravings of machine tools represent some of those made by the well-known firm of Gould & Eberhardt, of Newark, N. J. They are made from new patterns and, in re-designing, the weight and strength of parts have been increased, the metal being carefully distributed to insure solidity and durability without clumsiness. Particular attention has also been paid to convenience of operating. This firm fit all wearing surfaces by scraping, no grinding with emery being practiced. Spindles, shafts and screws of all their machines are made of steel. All cone pulleys are balanced by being turned inside.

The shaper shown, although the engraving is from their 15″×20″ machine, fairly represents any of the five sizes built by them, viz.: 8″×10″, 10″×15″, 15″×20″, 20″×25″, and 25″×30″. The bases are of column form, with large bearing surface on floor. Recent improvements in these tools are, arm vises, deeper cross-heads, and larger bearing surfaces generally. They are provided with a swivel vise having steel-faced jaws projecting outside to hold either long or short work for planing the ends, such as punches, rods, etc.; work can be as quickly fastened as with the common vise, at any angle, or to plane any bevel. The center on vise can be raised or lowered. The vise is quickly replaced with a face plate, only one bolt being used.

The tool bar is worked by a peculiar adjustable crank motion, giving slow forward and quick return motion. It can be instantly set to any stroke, either when in motion or at rest. The stroke is graduated, a pointer indicating the exact length.

The cross-slide is arranged to stop automatically at each end, so that little attention is required to keep the machine at work. It is self-feeding, across or circular.

All sizes of these machines have four-speed cones, and are furnished with countershafts, face plates and wrenches.

Extra attachments, such as index centers, circular mandrel, rack-cutting attachment, spiral attachment for cutting any spiral, attachment for special circular motion by which concave or convex surfaces of heavy pieces may be planed, the last two recently-added improvements, are furnished when desired, and fit these machines for a large variety of work.

The planer shows the general design of the variety of sizes made by this firm. The beds are deep and well ribbed. The bolt slots are planed and pin holes reamed to size. The ways are protected from dirt by a bead on each side of the V's.

The shifting device is so arranged that when the dogs are set the table can be run back to examine or change the work without disturbing the dogs. The return speed on the different sizes ranges from 80 to 120 feet per minute. Two driving belts are used.

The lathe shown is a 16″ quick-stopping hand lathe, adapted to be used by pattern makers, brass finishers, machinists, tool and die makers, etc. It has several new features, one of which is a quick stop, operated by friction shown in head. This enables the operator, by slightly pressing on the lever, to stop the lathe instantly. Another new feature is the tail stock, being concave on the front side, permitting the compound slide rest to turn small taper work, such as plugs, etc. The hand rest is clamped fast, thus avoiding the bruising up of the shank. The live spindle is made of steel, running in the best de-oxydized bronze, and has a $\frac{5}{8}$″ hole through it. The front bearings are $1\frac{3}{4}$″×5″ long. The cone has four changes of speed for $2\frac{1}{4}$″ belt. The tail stock and hand rest are fastened by an eccentric lever. A long and short hand rest, one face plate and wrench go with each lathe. These lathes are also made with back gear at an extra cost, also with compound slide rest for brass workers and lever attachment for light and quick drilling. Beds can be made any length, and wooden cones in place of iron if desired. These tools are sold in Chicago by the Niles Tool Works, and in St. Louis by Hill, Clarke & Co.

LETTERS FROM PRACTICAL MEN.

Flue Rolling Expander a Patented Device.

Editor American Machinist:

In your issue of August 16 you show cut of a new flue rolling expander, of course not knowing that the tool is subject to letters patent. You will see by letter-head that I have letters patent on an adjustable tube roller expander, and any adjustable roller expander, or expander where rollers enter tubes independent of body, is an infringement on my patent. Being a subscriber to your valuable paper since November, 1878, I know that you try to do justice to the public and your subscribers, and do not intend to give cut of new invention covered by patent unless so stating. JOHN H. MCGRAW.

Inertia of the Reciprocating Parts of the Steam Engine.

Editor American Machinist:

I have read with interest Mr. Nystrom's very lucid statement of the theory of inertia, or rather of acceleration and retardation, as applied to the reciprocating parts of steam engines, under the assumption that the connecting-rod is of infinite length.

The subject is treated with great fullness and with remarkable lucidity in Charles T. Porter's admirable "Treatise on the Richards Steam Engine Indicator, and the Development and Application of Force in the Steam Engine," Section II, pp. 188-238. The diagrams on pages 188, 205, and 225, and the folded diagram No. 49, facing p. 223, show the general treatment of the subject. The diagrams No. 56, p. 225, show plainly why the diagrams produced by Mr. Williams' clever and useful inertia instrument give a curved line. It is because actual connecting-rods are not of infinite length. The curvature will be found to vary, as it ought to vary, with varying lengths of connecting-rod in terms of the crank. The folded diagram, No. 49, above referred to, shows the curves for two lengths of connecting-rod four times and six times the length of the crank. I think Mr. Nystrom a little underestimates the effect of the angular vibration of the connecting-rod. In the actual diagrams from a Buckeye engine at the Merrimack Mills, Lowell, published on page 4 of your issue for June 7, 1884, the straight lines which represent the *mean* effect of acceleration and retardation (corresponding to the effect with connecting-rod of infinite length), are given, together with the curved lines representing the *actual* effect at each end of the cylinder in that particular case.

The lines marked "horizontal pressure on the crank-pin," are laid off in accordance with the curved lines, and would be far from correct if laid off in accordance with the straight lines. It will be observed that my straight lines do not make an angle with the horizontal, of 45°, as do the corresponding lines in Mr. Nystrom's (and in Mr. Porter's) diagrams. This is because my lines are laid according to the actual scale of the diagrams, and not on a scale of trigonometric functions of radius=unity.

To Mr. Charles T. Porter is undoubtedly due the credit of the first thorough investigation of this important subject. Prof. Joseph F. Radinger, of Vienna, in 1872, in his interesting treatise on high-speed engines (Ueber Dampfmaschinen mit hoher Kolbengeschwindigkeit), [Phoebus! what a name!—it means piston speed] awards Mr. Porter this credit.

In Vol. 5 of "Engineering," pp. 119, 143, 159, 184 and 200, will be found an article by Mr. Porter on the Allen Engine, in which the subject of the acceleration of the reciprocating parts of steam engines is fully explained, probably for the first time in any scientific or technical publication. On page 159 a cut is given illustrating this very matter of the modification of the line representing acceleration and retardation (positive and negative acceleration), due to the angular vibration of the connecting-rod.

Mr. Porter's admirable treatise, first above mentioned, ought to be made a constant companion and an ever-renewed study by all who have the care or management of steam engines. I find the re-perusal of a large part of it every few months a very useful employment of time, as well as a lively pleasure. J. C. HOADLEY.

Pressure in Hollow Pistons.

Editor American Machinist:

A few days ago we had occasion to break up four old steam pistons 32″ diameter, 9½″ face, that had been out of service and lying in the weather for periods varying from eight months to two years. The pistons were ¾″ thick on the flat heads and ½″ thick at bottom of packing-ring grooves. There were three radial ribs, dividing the internal parts of the pistons into three sections each. There were two plugs 1¾″ diameter, tapped solidly into each of these spaces, to fill up the core-print holes.

The piston rods were still in pistons. One of the pistons was placed under the "drop," and the first blow broke a hole in one of the spaces without unusual noise, but when the piston was turned partly over and the drop fell the second time, the second sector-shaped compartment exploded with violence, and a loud report, throwing a 7″x15″ piece of the iron high in the air, which piece fell forty paces away from the piston.

Inside the piston we found about 2 lbs. of a black, lumpy material, like the sample sent you, which seemed to be composed of the residuum of tallow, quite dry and hard. We also found several pieces of $\frac{3}{16}$″ wire, which had no doubt been used in making the cores and left in through neglect of casting cleaners.

The explosion was so violent that, out of consideration for the safety of the men working in the vicinity, I caused a small hole to be chipped through the rim into each space of the remaining pistons before breaking them, and we found that nearly all were filled with air or gas at a great pressure.

These pistons had been used in cylinders that had been plentifully supplied with tallow for a number of years. The question is, how did the lumps of tallow get inside of these spaces, the walls of which were solid enough afterwards to retain gas at a high pressure for months and years? The cause of the generation of this gas is an interesting question. All the solutions that I have so far seen apply to gas formed inside of pump plungers. Perhaps some of your readers can explain the cause.

E. F. C. DAVIS.

Pottsville, Pa.

Facing or Blackening.

Editor American Machinist:

Competition is everywhere driving foundrymen to produce smoother castings. This can be well and cheaply done by the use of properly prepared, good quality plumbago or black lead as a blackening or facing. Something is needed that will prevent the sand of the mould from being burned by the molten metal; that will cause the casting to "peel" readily; that will deliver the casting smooth from the mould, with a "slick" surface and a bright color. To do this the blackening used must be refractory, something that will neither burn nor run before the molten metal at the time of pouring; it must adhere firmly to the surface of the mould, and part well, or "peel" readily from the casting; it must admit of being smoothed or "sleeked" in the finishing of the mould; finally, it must give the casting a uniform bright color. Plumbago (or black lead) blackening or facing, if of good quality and properly prepared, will do all this. It will do it both well and cheaply, as enough of the expense of dressing castings will be saved to more than pay for the blackening.

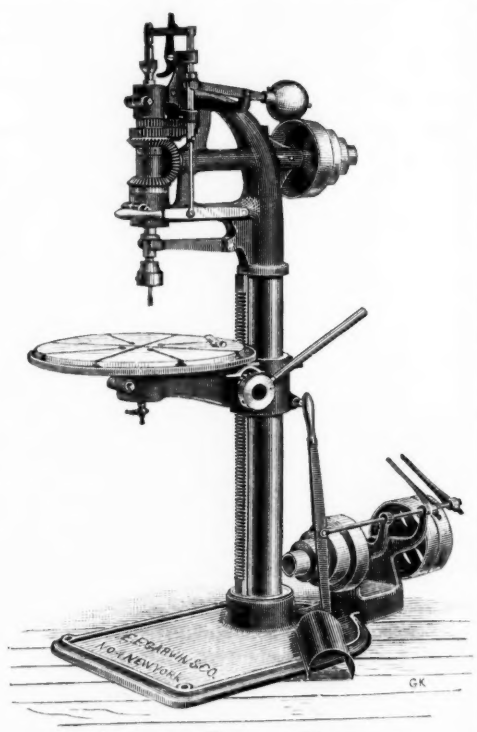
JOHN A. WALKER.

In the recent destruction by fire of the Winslow laboratory of the Rensselaer Polytechnic Institute, at Troy, some of the rarest mineralogical specimens in the country were destroyed.

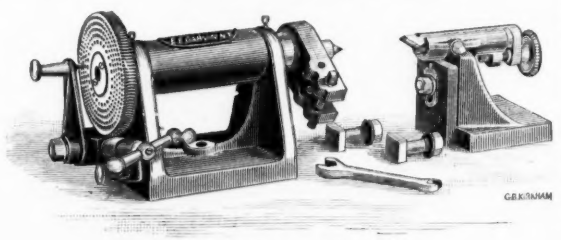
Automatic Tapping Machine and Centers.

It would seem that the subject of automatic tapping machinery had received scarcely its share of attention from machine tool builders, considering the important place it should occupy in the present long and varied list of labor-saving machine tools. E. E. Garvin & Co., of 139–143 Centre St., New York, have brought out something new in this line, which we illustrate herewith.

It is an automatic machine for tapping from ⅜″ diameter down. The action of the machine is such that the least responsibility is placed upon the operator, his only care being to start the tap by pressing down upon the lever shown in cut until it holds itself in the work, the remainder of the action being entirely automatic. When the required depth has been tapped, the hook which holds the clutch into the forward motion is tripped off, allowing a weight to lift the clutch into the reverse motion, which runs at a higher rate of speed, affording thereby a quick return. When the tap has run out the spindle is lifted clear of the work by a weight which hangs in the column.



AUTOMATIC DRILLING MACHINE.



PLANER OR MILLING CENTERS.

The machine is fitted with a 24″ round table, which swivels upon its own center, and also upon the axis of column, upon which it has an ample vertical adjustment by means of a rack and lever movement, being securely bound to the column by clamping with two bolts.

The table has an oil groove around its circumference, communicating through the T-slots with the hub, which is cored out to form a receiver for oil, which can be drawn off through a cock underneath.

The machine is driven with a 2″ belt over cones allowing four changes of speed.

The spindle is of steel $1\frac{5}{16}$″ diameter. The weight of the machine, complete, is 675 lbs.

The centers here illustrated, manufactured by the same company, are a well made and rigid head and tail stock, that will swing 12″, and can be used for any work within that limit upon the milling machine or planer.

The worm gear is accurately drilled for an index with five circles of holes, as follows: 26, 44, 54, 64 and 70. The worm can be dropped out of gear when it is desired to turn the dial by hand.

The tail stock is provided with an elevation for the center for the handling of taper work. Head and tail, together, weigh 90 lbs.

Running a Local Train on Time.

In coming from Philadelphia the other day by the Bound Brook route we noticed the locomotive performed what we considered remarkable work in getting the train into speed. At one station, which was on a level piece of track, the engine started the train and passed the first mile in one minute and thirty-five seconds. Even with this high starting power, the fourth mile was reached before the train attained a mile-a-minute speed. The train weighed about one hundred tons, and was pulled by the Philadelphia & Reading Railroad engine 381. This engine has cylinders 18½x24 inches, the drivers are 68½ inches diameter, and the boiler supplies steam freely however hard the engine is worked, yet all this power is fully needed to take this light train 59 miles in 101 minutes, making ten stops and slowing up several times for crossings. It is well known to railroad train men that the hardest train to get along on time is that which stops frequently and is rated at a moderate speed, for there is a universal tendency among those who frame time cards to allow too short time for stopping and starting.

The Fifty-third Annual Exhibition of the American Institute of New York City will open September 24th, 1884. The management announce their readiness to receive heavy machinery now, and other goods September 15th.

The *Industrial World* copies, with apparent sincerity, from the daily press the outlines of a pneumatic tube scheme of alarming proportions. According to our contemporary, a brass tube is to be laid from New York to Chicago, and "a powerful engine with an exhaust wheel is to be stationed at one end." Eventually two tubes are to be used, but "with one pipe the plan is to reverse the engine every hour—the first hour forcing air into it at Chicago and sending packages to New York, the next hour exhausting the air at Chicago and drawing the packages as quickly back." It is proposed by this plan to send packages from New York to Chicago in "less than a minute"—just how much less is not stated, probably because it is thought best to keep well within the limit. As 1,800 feet per second is high initial velocity for a cannon ball, those interested can easily figure out how much faster than such a projectile the package will travel. It might suggest itself that there would not be much left of a parcel that had traveled in contact with air at a velocity of something more than fifteen miles per second, but we suppose this is provided for by the "leather ball" in which the packages are to be sent. Just how air at a pressure of one atmosphere is to be got through the pipe at the required velocity is not stated, but then that is probably of "no consequence." We learn from our contemporary that "it [the company] is expected to pay a large profit," which is, of course, interesting news. The only further information necessary is where the stock can be had.

Machinery at the Philadelphia Electrical Exhibition.

Through the kindness of Prof. Marks, a representative of the AMERICAN MACHINIST was enabled to make notes of the condition of the Electrical Exposition the week before opening. As usual, most of the exhibitors were very far behind in getting their exhibits prepared, and a week before opening day exhibits were mostly to be seen in the shape of closed boxes scattered throughout the building. The engines provided to supply power were mostly in position, and they are quite numerous, considering the number of machines to be driven. Nearly all the engines and machinery are located on the north side of the building, which is equipped with the necessary shafting, and has the advantage of being near the boilers, which are all outside the north wall of the main building. The largest engine in the place is a Buckeye, from Salem, Ohio, 18x36. There are two of this size. A Porter-Allen, 18x30, comes next, and there are two smaller engines of

the same make in the building. Two Westinghouse engines of 100 horse-power each, are there: four Armington & Sims have been put in place, and the list of American steam engines includes 1 Taylor, 1 Bull, 2 Southwark, and 2 Sweet Straight Line Engines. The Straight Line engines are placed on the side of the building across from the other machinery, and they will work under serious disadvantage, for the steam supplied to them must pass through about 200 feet of piping. An English three-cylinder engine, of the Brotherhood make, is connected direct to a French dynamo. Gas engines are represented by two Clerk and three Schleicher & Schumm "Otto" engines. One of the latter is a 15 horse-power twin engine. At this exhibition there will be a good opportunity, by means of these engines, to test what there is in Prof. Sylvanus P. Thomson's expressed opinion that a gas engine is wholly out of the question as a source of power for driving electrical machinery, owing to inequalities of speed.

The managers of the exhibition appear anxious to make everything in the building worthy of attention of visitors, for even the boilers that supply steam to the engines will be objects well worthy of inspection. There are four Babcock & Wilcox sectional boilers, three Harrison safety boilers, one Root sectional, and two locomotive boilers. The boilers are all conveniently set for examination.

A prominent attraction of the exhibition will be the so-called Jumbo dynamo machine in the Edison collection. The armature of this machine is connected direct to an Armington & Sims engine of 170horse-power,and the whole machine, of which the engine is part, weighs 45 tons. The armature alone weighs 5 tons. An attraction of the exhibition in the way of a curiosity is the electrical fountain in the center of the building. This is made so that each jet of water passes around an electric light and the glitter is carried by the spray of water, producing a beautiful effect. The water for this fountain is pumped by a Worthington pump, which is already in position. A part of the United States Ordnance Bureau exhibit was on the floor of the exhibition, and the complete collection promises to be exceedingly interesting.

Several electrical appliances for detecting the approach of torpedo boats at night are among this exhibit. The instruments consist of short cylinders with lens and mirror, which form a marine telescope by aid of the electric light. The indications are that the exhibition will be exceedingly attractive in valuable practical devices, and that there will be interesting trifles enough to amuse those who cannot appreciate a device on its intrinsic merit.

New Hand Pipe Threading Tools.

We show with this engravings representing some new hand pipe threading tools, manufactured by the Eaton, Cole & Burnham Company, 82 and 84 Fulton St., New York. Fig. 1 represents a two-handled die stock, with adjustable dies to cut all sizes pipe from ½" to 2", inclusive. To do this requires three sets of dies, each set cutting two sizes of pipes.

The guide for the pipe is formed by three dies, the dies being adjusted to size by means of cams, all operated by one motion of the projecting handle, the necessary adjustment for any size of pipe being substantially instantaneous.

The cutting dies, four in number, are inserted in slots on the circumference of the circular part of the slot, and cams inside engage with them, moving them inwardly or outwardly. This cam motion is operated by the single handle shown on the stock, and graduations show to what point this handle should be turned to cut different sizes of pipe. This makes all the necessary changes, from substituting new dies to setting for any diameter of pipe, occupy but a fraction of a minute.

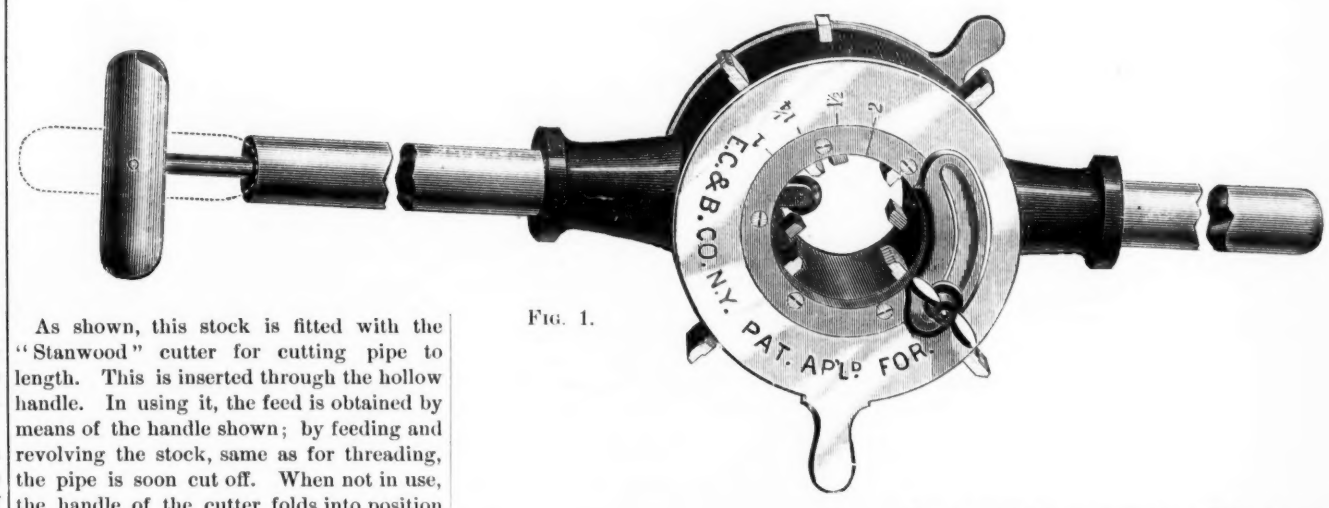


FIG. 1.

As shown, this stock is fitted with the "Stanwood" cutter for cutting pipe to length. This is inserted through the hollow handle. In using it, the feed is obtained by means of the handle shown; by feeding and revolving the stock, same as for threading, the pipe is soon cut off. When not in use, the handle of the cutter folds into position shown by dotted lines, out of the way. This stock is furnished with or without the cutter, as desired.

FIG. 2.

Fig. 2 represents a ratchet die stock, for use in places where, for lack of room, the ordinary die stock cannot be used—as, for instance, in threading pipe in place, etc. The ratchet is readily reversed for screwing off.

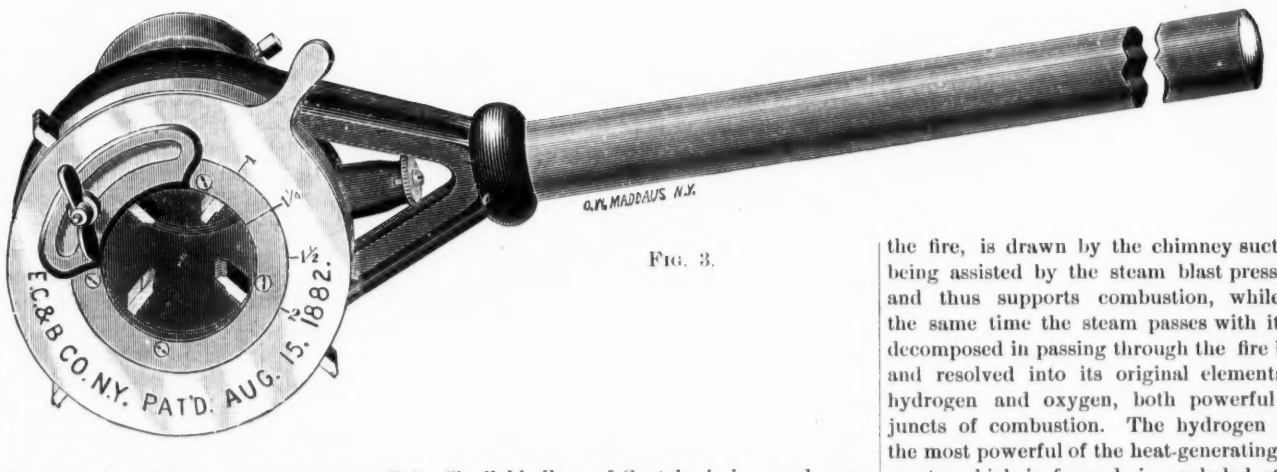


FIG. 3.

Fig. 3 represents the ratchet stock arranged for using open dies, the same as used in the stock shown at Fig. 1. With both ratchet stocks a solid leader, with leader screw, is used, since the facilities for starting the thread by pressure do not exist in the use of the single-ended lever of the ratchet as in the double-ended regular stock.

The different parts of all these tools are made interchangeable, and may be duplicated at any time. They are well made and quick-working tools, and fairly represent the advances that are demanded and are being made in this important class of tools.

Worthless Hardware Products.

Mr. C. B. Webster, the United States Consul at Sheffield, reports that the production of rubbish hardware is increasing to an alarming extent in that headquarters of English cutlery. The cutlery trade is grievously missing the influence that the guild of cutlers used to exercise over the production of the district when they had the power to destroy any cutlery that was found to be made of material inferior to what it professed to be. The demoralizing power of unrestricted competition has pulled down prices so grievously that pocket knives are now sold at 2½ cents each, and good looking razors at 75 cents a dozen, and the parties that make them have to make a living from the profit realized. To make cutlery at such a price the most inferior material has to be used. With all the patent processes of the present day it has come to be very difficult to know with certainty what kind of material is bought under the name of steel. In Sheffield alloys of Scotch pig-iron and scrap are made into castings by certain enterprising parties and vended as crucible steel castings, with a tensile strength of only about 8 tons per square inch, and very far inferior for standing wear and tear and in strength to good honest anthracite pig-iron. Yet the demand for cheap steel-producing processes goes feverishly on, and the same causes that keep up this demand will be at work when good cast steel becomes as cheap as pig iron is to-day, should that point of cheapness ever be reached.

Slack Coal as Fuel.

The Board of Trade of the City of Scranton Pa.,has published a report drawing attention to the enormous quantity of excellent fuel accumulating round that city in the form of waste culm from the coal mines. This is claimed to be, in some respects, the best of the coal, and it is being piled up in enormous quantities, for in some of the mines twenty per cent. of the output goes into the culm heap. In the Lackawanna district alone upwards of 6,000 tons of culm collects daily. Those interested in the welfare of the district wish to see part of this fuel utilized, and the Scranton Board of Trade believe that it might be used to good advantage in providing cheap power for manufacturing purposes. Their report says:

"The question of using culm for power purposes is no longer an open one. The invention of proper fire-cleaning apparatus and the application of a steam blast has already accomplished a complete solution of all the intricacies and difficulties.

"Coal waste will not burn alone; it is too fine to allow the passage of a sufficient quantity of air through it to support active combustion. It has been discovered that a certain proportion of dry steam, injected beneath the grate surface in connection with a proportionate quantity of air, will produce and sustain an active, or rather a violent, combustion of culm.

"The construction of the apparatus is very simple. It consists of a closed ash-pit, into which one end of a funnel or cone-shaped pipe is inserted, the larger end being upon the outside. At the mouth of the cone is placed a steam jet, which, when turned on, directs its volume to the neck of the cone, and the tendency of the steam to spray, as it leaves the jet orifice, carries with it a large quantity of atmosphere. The air, passing through the fire, is drawn by the chimney suction, being assisted by the steam blast pressure, and thus supports combustion, while at the same time the steam passes with it—is decomposed in passing through the fire bed, and resolved into its original elements of hydrogen and oxygen, both powerful adjuncts of combustion. The hydrogen gas, the most powerful of the heat-generating elements, which is formed, is exploded at the surface, and the oxygen unites in the ordinary manner with the carbon, altogether producing a fierce cutting temperature in the fire-box.

"When this process became established, another was soon suggested. The difficulty of fire cleaning presented itself, has been removed by several valuable applications of mechanical grate beds—constructions that have their principle in some positive mechanical action to cut away the refuse of the fire-bed without opening the doors. Every positive mechanical difficulty has been overcome, and the consumption of pure culm is an accomplished fact."

The New York Elevated Railroad Company have lately adopted metallic packing for the piston and valve stem stuffing-boxes of their engines. Special tools of ingenious design have been prepared for turning out the packing quickly.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Pres't.

JACKSON BAILEY, Vice-Pres't.

LYCURGUS B. MOORE, Treas. and Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

F. F. HEMENWAY, ANGUS SINCLAIR, } Mechanical Engineers.

The American News Company,
Publishers' Agents, New York.

The International News Company,
11 BOUVERIE STREET (Fleet Street), LONDON, ENG., will receive subscriptions for the AMERICAN MACHINIST, at 14/7 per annum, postage prepaid.

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, SEPTEMBER 13, 1884.

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Insurance of Country Machine Shops.

We received some time ago, from the owner of a Southern machine shop, a letter stating that the insurance companies doing business in the district where he was located charged enormous prices for insuring buildings used for manufacturing purposes. The different companies had evidently formed a combination to keep the charges high, for no relief could be obtained by making a change. At the request of our correspondent, we consulted with several companies whose headquarters are in this city, about attending to the business of Southern machine shops, but they all refused to have anything to do with insuring of buildings in districts where they had no agent to personally examine the premises.

We would suggest to the machine-shop owners and others in the Southern States, or in any region where insurance rates are abnormally high, to combine together and form mutual insurance companies, when they will have the remedy in their own hands. Action of this kind will also impress upon them the necessity and importance of having efficient fire extinguishing appliances kept in working order in every place where fires are liable to occur. In many instances, the unwillingness of insurance companies to take risks on manufacturing establishments located in country towns arises from the inadequate means provided for controlling fires. There are few rural districts where agitation in favor of better fire-engines and more liberal water supply would not tend to effect improvements that in a short time would encourage insurance companies to reduce the rates of insurance. This is a line of self-help that ought to receive immediate attention from all country manufacturers.

If some of the newspapers published in manufacturing towns and cities would devote more of their space, under an easily found heading, to the chronicling of items of news relating to existing and prospective manufacturing and industrial enterprises, they could afford to abridge some of the lengthy political dissertations, which neither greatly instruct their readers nor do anything towards building up their town.

We have received a complimentary ticket and invitation to attend the Cincinnati Industrial Exposition, which opens September 3 and closes October 4, 1884. We never accept complimentary tickets of admission, preferring to pay our way; but we wish well to the exposition, and hope it will be largely attended.

Case Hardening Suggestion Accepted.

Although the Baldwin Locomotive Works have long been famous for building good locomotives, the mechanical engineers who preside over that establishment do not profess to possess perfected knowledge as to the behavior of iron and steel under all conditions to which these metals can be subjected. It was in searching for more light that they engaged in the experiments with case-hardened iron that were noted in our columns a few weeks ago. In pursuing this line of investigation they readily accepted the suggestion made in the AMERICAN MACHINIST by Professor Sweet, to try the effect of annealing and rehardening on iron that has deteriorated in strength from case hardening. They had not before thought of this remedy, and they are quite willing to acknowledge the source from whence they obtained information they now propose turning to practical use.

Complicated Discount Systems.

Considerable discussion is going on just now in hardware manufacturing circles, about the advantages and disadvantages of the complicated systems of discounts arranged by the various manufacturers for the various classes of purchasers of those goods. The conclusion seems to be that confusion and cutting of prices are the necessary consequences.

Doubtless there are some kinds of machinists' tools and supplies, in which the same line of discussion would lead to the same conclusion. At first sight, the interest of consumers may in this matter seem to be adverse to that of the manufacturers and dealers, but it is questionable, whether, in the long run, consumers derive any real advantage from practices which tend to cause disorder in manufacturing and commercial circles.

The experience of most manufacturers who issue descriptive catalogues is in favor of the plan of omitting the prices entirely in the catalogue and publishing them wholly in the form of extra sheets. In this way, the catalogue does not so soon become obsolete, and prices can be changed from time to time, as the needs of trade require, without the aid of a long string of demoralizing and fluctuating discounts.

By the heading of the article last week on "Sizing Gear Wheels" we did not intend to be understood as attributing to Warner & Swasey the originating of this method. This firm has simply taken up a plan quite generally known, and put it in such convenient shape in their catalogue, for general use, that we desired to give them due credit for doing so, and at the same time to give the information to such of our readers as were not acquainted with the method.

High Speed of Railroad Trains.

In another page we publish an article on "The Fast Locomotive of the Future" where a practical mechanic discusses the necessity for making changes on the locomotive to meet the demand for increase of train speed. We publish the views of Mr. Van Fleet because in a general way he echoes the sentiments of many men who interest themselves in the subject treated, but in many respects we hold views diametrically opposite to those expressed in the article. We think there is a disposition indicated by many engineers to look for a new type of locomotive that will achieve wonders in high speed performance without properly considering the capabilities of the existing engine. To take a train along a fairly level and straight track at a continuous speed of a mile a minute is a performance quite within the power of many engines that are running on our railroads, but the train must be light. Our correspondent asserts that the engine has not been built that will take a moderately heavy train 100 miles in 100 minutes. There may be a difference of opinion about what constitutes a moderately heavy train, but we certainly know that many engines can easily hold steam to pull a train weighing one hundred tons the distance named at the required speed on a tolerably level road, if the engine is permitted to run without having to reduce speed every few miles. There is no difficulty in maintaining a speed of sixty miles an hour. The arduous problem of fast train running on nearly all our railroads is, to make up for loss of time in moving slowly through towns and over railroad crossings. To maintain a card time of a mile a minute the engine must be capable of running part of the way at seventy or seventy-five miles an hour. Going to Philadelphia lately on an ordinary express train we timed the speed during the greater part of the way, and found that more than half the distance was run at speed above sixty miles an hour, and several miles were made in 50 seconds each, although the schedule time was slightly under forty miles an hour, with nine stops to be taken out besides several slowings for towns and crossings. That engine was pulling five coaches and it could easily have done the work of keeping up sixty miles an hour speed, or a little higher if the character of the road had so permitted. A change in the type of locomotive is not so much needed for high speed as changes in the railroad surroundings that will permit trains to run right along after they are started.

Some of the changes on the locomotive which our correspondent suggests are of doubtful value. A second boiler would certainly be a most inconvenient arrangement. The most promising line of improvement is that which tries to increase the size of fire-box and augment the heating surface, and many able engineers and inventors are working on this problem, but the ablest men are agreed that it must be carried out on a single boiler. A great many men who are interesting themselves in accelerating the speed of trains wish to transport people at high velocities as cheaply as they can be moved at moderate speed. This cannot be done. By incurring immense expense in constructing over-head crossings, straightening out curves, in cutting down grades, and perfecting their signal systems, our railroad companies could easily, with their present machinery, run light trains at a continuous speed of sixty miles an hour, but the American traveling public are not prepared to pay for the great outlay of money. If they ever get ready to foot bills of that kind, we doubt not but the accommodation will be forthcoming.

Memorial of Alexander Lyman Holley.

The above heading is the title of a volume, containing 222 pages, recently issued by the American Institute of Mining Engineers from the office of the secretary, 13 Burling Slip, New York. Every one who knew and loved Holley will want a copy of this book, and we are glad to learn that its distribution is not to be confined to the technical society which has published it.

The book contains an account of the funeral services, including the masterly and affecting discourse of Rev. Henry Ward Beecher. It also contains full reports of the addresses delivered during the memorial sessions of the three great engineering societies of which the deceased engineer was a member, and, while all are interesting reading, many of these contain much information that will be of value to many mechanics. The eloquent address of Rossiter W. Raymond, in particular, contributes forty-three pages to the book, while a considerable portion is devoted to reprinting some of the specially valuable papers which Holley had at various times read before engineering societies, the volume being fitly prefaced by an admirable and speaking likeness of Holley, showing him as he was before the burdens of overwork had been too heavily laid upon him. We understand that the necessary funds have been raised to erect a statue in his honor in Central Park, New York City, but monuments of this sort can only imperfectly perpetuate the memory of such a man. The volume before us will be sold at $2 a copy.

Literary Notes.

MODERN REPRODUCTIVE GRAPHIC PROCESSES. By Jas. S. Pettit, First Lieutenant First United States Infantry. D. Van Nostrand, publisher, 28 Murray and 27 Warren Streets, New York. Price, 50 cents.

The author in his preface states that the matter was "prepared for the use of the department of drawing of the United States Military Academy, as a basis for elementary practice in, and with a view to the imparting of, some analytical knowledge of the means employed for the production of the many beautiful and useful prints that are constantly brought before the public." Amongst the various processes detailed, the blue print process will be of the most general interest to mechanics, while the various processes in photography will be found of value to amateurs and to others.

THE PRINCIPLES OF VENTILATING AND Heating, and their Practical Application. By John S. Billings, M. D. The *Sanitary Engineer*, New York. Price, $3.

The methods of ventilating and heating dwellings, if properly carried out, exert such direct influence upon the public health that the correct way of doing so cannot be too widely taught. This book is likely to prove a valuable contribution on the subject, for it contains a great deal of useful information, lucidly and systematically prepared so that it applies directly to the American climate and dwellings. Although in some parts the statements regarding the laws of gases and

the chemistry formulas make the book somewhat formidable to the ordinary reader, there are few intelligent architects, builders, or plumbers but will get through it without difficulty. It treats of "relations of carbonic acid to ventilation; methods of testing ventilation; heat, and some of the laws which govern its production and communication; movements of heated air; methods of heating; stoves, furnaces, fireplaces, steam, and hot water; patent systems of ventilating and heating," and many other subjects equally important. The book is illustrated by many engravings, which serve to elucidate the text.

The *New York Dry Goods Bulletin* uses the following happy expression:

"The 'Poet's Midnight Lamp' has been eulogized to the skies, but the tallow candle of the inventor, which often burns all night upon his bench, leaves only an ominous shroud of grease that too frequently foretells his fate."

A correspondent would be obliged to some one acquainted with the process, for information as to the best process for reducing sulphur to a powder.

In our issue of February 23, 1884, we published an inside view of the new combination formed to advance the prices of wrought iron pipe, boiler tubes, etc., stating the reasons, in our opinion, why it could not hope to hold together. It has not held together. Prices have been quietly cut from the start, and are now thoroughly demoralized, while the organization has practically collapsed.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must in variaby be accompanied by the writer's name ana address. If so requested, neither name, correct initials, nor location will be published.

(345) H. B. V., Newark, N. J., asks: How can I get a nice blue color on steel? A. By heating the articles in fine sand in an iron box; or, instead of sand, you can use wood ashes, or finely broken charcoal.

(346) D. J. A., Boston, Mass., asks: What is the horse-power of an engine 10″x20″, at 75 revolutions. *A.*—We suppose you refer to an engine with plain slide valve. If of good construction, with steam pressure 70 lbs., about 20-horse power.

(347) R. A., Dayton, Ohio, asks: Can you tell me of an electric engine that will give satisfaction in running a boat, about 35 feet long, or would it be better to use a steam engine? *A.*—It would be better to use a steam engine. There is as yet no electric engine manufactured that will give satisfactory results.

(348) J. M., Winona, Mich., asks: 1, What should be the pitch and face of a gear wheel 24″ diameter, running 50 revolutions per minute, to transmit safely 25 to 30 horse-power? A. If the shock in running is not excessive, 2½″ pitch, 6″ face will answer. 2. What should be the width of belt on 24″ to 28″ pulleys, running 200 revolutions per minute, to transmit 25 horse-power? A. Belt 20″ wide will be satisfactory.

(349) Engineer, Abilene, Kan., asks: 1. What kind of soda is used in boilers? Is it the same as used in washing? *A.*—The proper kind of soda to use in boilers is carbonate of soda, the ordinary commercial soda. It is frequently used for washing. 2. What kind of a hydrometer is best to use for testing water from a boiler? *A.*—We cannot recommend any particular maker's goods. Call on, or write, to dealers in such goods.

(350) J. B., Jersey City, N. J., asks: What working pressure will a horizontal tubular boiler of the following dimensions stand: Diameter 54″, length 15′, 66 tubes 3″ diameter, thickness of heads and shell ¼″? *A.*—¼″ is a thin head for securely holding tubes. Otherwise than this if the heads are well braced and the boiler in good condition and made of iron of a tensile strength of 45,000 lbs., it should be safe at a pressure of 50 lbs.

(351) H. D., Matteawan, N.Y., asks: Will you tell me how many gallons of water a tank 37″ deep, 96″ wide, and 118″ long will hold, giving me an explanation of the way you determine it? *A.*—A gallon of water is 231 cubic inches, hence if you find the contents of the tank in cubic inches and divide by 231 you will have the contents in gallons. Thus, multiplying together 37, 96, and 118 gives 419,136 cubic inches, which, divided by 231, gives 1,814½ gallons, nearly.

(352) J. N. R., Philadelphia, Pa., writes: In your issue of March 1, under the head of "The Indicator Diagram," is a rule analogous to but more simple than others for finding the theoretical steam consumption in an engine. As I understand it this is the weight of steam, and the operation must be carried a step further to find the theoretical water consumption. Am I right? A. No. The plan given was for finding the weight of water that was in the state of steam in the cylinder at a point just before exhaust opening.

(353) A. K., Concord, N. H., asks: Will you please explain the term pitch as applied to gearing? Some authorities define it as an arc and others as a chord. *A.*—The circular pitch is the length of the part of pitch circle from the center of one tooth to the center of the next one. In making calculations of gearing the length of the arc should be referred to. The chordal pitch is the same distance measured in a straight line. Some writers on the subject give rules for calculating gearing from the chordal pitch, but they are not generally used.

(354) W. M. C., Ravenna, O., asks: 1. Why is it that by increasing the diameter of both pulleys the power of the belt is increased? *A.*—Mainly because the speed of the belt, in feet per minute, is increased. 2. Will a belt transmit more power at, say 1,000 feet per minute, over pulleys four feet diameter, than over those two feet? *A.*—Not necessarily. With a heavy belt, the four-foot pulleys may do the best; with a light one, the small ones would be quite as effective. 3. Is the strain on a belt increased, when the machinery is in motion, over the strain on it with the machinery at rest? *A.*—Yes.

(355) J. W. E., Chillicothe, Ohio, asks: 1. How do you find the sizes of steps of cone pulleys, the size of steps on one pulley being known? A. You will find this very clearly explained in the AMERICAN MACHINIST of Feb. 25, 1882. 2. A builds a traveling crane that travels longitudinally on two pairs of 8″ wheels, moved by a 24″ rope wheel. A small carriage travels transversely on this on 4″ wheels, moved by a 12″ rope wheel. Can each carriage be moved by the application of the same power? A. Yes; with the exception of the weight of the lower carriage, and a little difference in friction, in favor of the large wheels.

(356) W. K., Dartford, Ont., asks: Is it possible for a locomotive to stop on dead centers; that is, while the cranks are on dead center on one side will they not be past the center on the other side? *A.*—A locomotive will not stop on dead centers, for the reason you intimate. 2 What is the date of some number of the AMERICAN MACHINIST which contains cut of an American locomotive? *A.*—November 3 and December 8, 1883. 3. Where can I purchase copies of the AMERICAN MACHINIST for 1881 and 1882? *A.*—From any newsdealer, or from this office. In answer to your fourth question, address the paper named by title, New York City.

(357) Rex, Attleborough, Mass., writes: I have in use a steam pump raising water to a height of 55 feet. I use on an average 9000 gallons per day. The pump, 3¼″ and 5″x7″, runs continuously 10 hours per day, steam being throttled so that it runs slow. The boiler that furnishes steam for the pump also furnishes steam for other purposes, and I should like to come at the probable cost of elevating this water on a basis of, say, coal at 3 mills per pound? *A.*—It would be impossible to more than guess at the actual cost of raising the water under the circumstances named. The best estimate we could make would be that it would cost the price of about 75 lbs. of coal per day.

(358) F. R. K., Camden, N. Y. asks: 1. Does a quantity of air at 50 lbs. pressure occupy double the space it would at 100 lbs., the same as steam? *A.*—Neither steam nor air will occupy double the space at 50 lbs. that it will at 100 lbs., but both do approximately. 2. Will a given quantity of air at 100 lbs. pressure do as much work in an engine as the same quantity of steam? *A.*—Under ordinary conditions not quite as much. 3. Taking 60 lbs. as a basis, what per cent. of useful effect can be obtained from exhaust steam for heating purposes? *A.*—About 75 per cent. of the total heat of the steam at 60 lbs. pressure will be found in the exhaust steam. How much of this can be utilized will depend upon circumstances. Perhaps 50 per cent. will be a fair average.

(359) T. A. F., Sanborn, Iowa, writes: I have a 5-horse power engine, and want to know how many cubic feet of sand or fine gravel I can elevate 20 feet per hour, using a chain belt and buckets, the engine running at 150 revolutions per minute; Please give me a simple method of calculating this. *A.*—The revolutions of engines has nothing to do with the question, provided it develops 5-horse power at the speed you run it. You can make the calculations as follows: One-horse power is equivalent to raising 33,000 lbs. one foot high in one minute, or 33,000÷20=1650 lbs. 20 feet high in one minute, hence 1650x5=8250 lbs. raised 20 feet per minute will equal 5-horse power, or 8250x60 =495000 lbs. per hour. Sand will weigh about 100 lbs. per cubic foot, and 495000 lbs.÷100=4950 cubic feet per hour. From this must be deducted the friction of the machinery. Assume this to be 30 per cent. (it may be more or less than that, but we have no more means of judging) 4950−30 per cent. of 4950=3465 cubic feet per hour.

(360) W. H., Graniteville, Mass., writes: 1. I am using neatsfoot oil on my belts. Does it injure the leather? A. We know of nothing better than neatsfoot oil, and if used moderately it will not injure the belt. 2. How can I tell good from poor bronze, say, when cast for boxes? A. It is very difficult for any one except an expert to judge of the quality of bronze castings. You will have to depend mainly on the honor of the parties making the castings. 3. Do you know anything of a sand-blast process for sharpening files? A. See AMERICAN MACHINIST of Sept. 17, 1881. 4. I am running an engine of the Corliss type, 12″x24″, 78 revolutions per minute, doing 12 horse-power work. How much coal ought I to burn? A. Probably about 1,000 pounds per day. It is very unsatisfactory running so large an engine doing so little work.

BUSINESS SPECIALS

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis pressure regulator and st'm trap. Aug.23, p.14.

Mackenzie Cupolas and Blowers, 245 Broadway, N.Y

Presses & Dies, Ferracute Mach.Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Rotary Files, Tower M.Works, E. Brookfield, Mass.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Crists' high-speed compound engines. Crist Engine Works, 182 Centre st., N. Y. Send for circular.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago Ill,

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

DRAWINGS — Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N.Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Steam users, expecting to put in a first-class engine, from 10 to 60-horse power, will find it to their interest to send to the Straight-Line Engine Company, Syracuse, N. Y., for their new catalogue.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

MANUFACTURES

The Georgia Pacific R. R. is to build shops at Birmingham, Ala.

The Alpine Iron Company, Alpine, Alabama, is erecting an iron furnace.

The Greenville Foundry and Machine Shop was recently organized at Greenville, Texas.

The Norton Iron Works, Ashland, Ky., intend erecting an iron rolling mill and nail factory.

The *Baltimore Manufacturers' Record* says H. E. McWane & Co., Wytheville, Va., are enlarging their machine shop.

Graff, Hugus & Co.'s stove foundry, Pittsburgh—will resume work, after a suspension of ten weeks, at the old rate of wages.

The Standard File Company, North Hanson, Mass., is a new file manufacturing concern, which expects to employ forty men by September.

Shoenberger & Company, at their Juniata Mill, Pittsburgh, are making nails of a mixture of one-third low carbon steel and two-thirds iron.

A new match factory is being built at Orono, Me., by Martin & Page. When completed this will be the third match manufactory in that village,

Work is to be renewed immediately on the mines at Hell Gate, near New York City. Nine acres will be undermined and exploded at the same time, by charges of dynamite

Frost & Davis is the name of a new concern to be organized in Boston and to come to Holyoke, Mass., for location, to manufacture knives for paper mill machines.—*Paper World.*

The Buffalo Electric Works, Buffalo, N. Y., have issued a new reduced price-list of carbon points and plates. They furnish plates, cups, and buttons of any desired size or shape.

The Quincy Metal Wheel Company has been incorporated at Quincy, Ill., by Ceylon Smith, Thos. Hill, James R. Little, Martin Heiderich, and Pliny B. Williams. Capital, $30,000.

The Bliss Mfg. Co., capital $250,000, has been recently incorporated at Chicago, to manufacture mining machinery. Corporators—Abel H. Bliss, B. N. Foster, and John J. Van Nostrand.

The Keeler Manufacturing Company has lately been incorporated at Highlandville, Mass., with a capital of $50,000. The company will manufacture shirts and drawers.—*Dry Goods Bulletin.*

The Yale & Towne Manufacturing Company, Stamford, Conn., has just issued a new pamphlet descriptive catalogue of their Weston-Capen friction clutches and pulleys, dated August, 1884.

The manufacturing companies of Nashua, N. H., are at present obliged to supplement their water power with steam. The only way to insure steady running is to have a steam engine ready to start at any time.

A new industry has been introduced at the works of the Boston Blower Company, at Hyde Park, in the manufacture of the Brown quadricycle. Thirty men are already employed in the work.—*Boston Com. Bulletin.*

The Anniston Land and Improvement Company, Anniston, Ala., offer substantial inducements, in the way of furnishing a portion of their working capital, to new manufacturing concerns who will locate in that town.

The *Lawrence* (Mass.) *American* is now printed by presses run by electricity. The power has been conveyed to the office over a wire from a dynamo more than a quarter of a mile from the office, and the working of the experiment has been perfect.

Victoria Furnace, near Goshen, Va., on the Chesapeake and Ohio Railway, is now being relined, and will go into blast about the 1st of September. A large force is now at work in the mines that supply this furnace, so it will commence operations with a large stock of ore on hand.

The Beechenbrook Foundry and Machine Works, Lexington, Va., is the name of a new concern, which is to build the Kriebel engines and boilers for the Southern States. A switch running by their door connects with the Chesapeake & Ohio, Richmond & Allegheny, and other railroads.

A correspondent writing from the Ames Mfg. Co's shops, Chicopee, Mass., says: "I consider your paper of more use to a young mechanic than his tools. Business here is good. We are building two sewing machines, the Post Combination and the New Eldridge. We are just finishing a contract for 500 'Victor' tricycles for the Overman Wheel Company. Machine work is fairly good."

The file manufacturing firm of Kearney & Foot, works, Paterson, N. J, and office 101 Chambers street, New York, has been changed to a stock company, The Kearney & Foot Company, the change in no way affecting the executive management of the business. James D Foot continues as president and treasurer, James Kearney as vice-president and general manager of the company's new works, while Sandford D. Foot takes the position of secretary.

J. H. Martin, Jr., writes us from Marinette, Wis.: Business here at Marinette Iron Works is good; have nearly completed a large sawmill for the Ludington, Wells & Van Schaack Co., of Menomonee, containing two double circulars and two of Prescott's improved 40-inch gauges. When complete, will be the largest mill in the State. We have also just completed an electric light plant, to be used in the stores, public buildings, etc., and have ten lights in machine shop. The Worth (Wis.) Iron Works, a new company just started here, have six months' orders ahead for wood planers, portable circular mills, straw cutters, etc., and promise to develop into an extensive works.

The Miller Co., Canton, O., are to remove next October to Crestline, Ohio, where they have struck a flow of natural gas much more than sufficient to light, heat and run their works. Their buildings now in course of erection are: foundry, 60x80 ft., with core-ovens and outbuildings for stock and reverberatory furnace; main building 420 feet long, with average width 40 feet; pattern-room is 40 by 50 feet, and two-story blacksmith shop, 40 by 40. The main building has a frontage of 700 feet, with switch to connect with two railroad lines. Crestline people generally are feeling very happy over the new gas well, and an industrial boom for the town is counted on.

A correspondent of the *Iron Age*, writing from Atlanta, Ga., says there is a splendid opening in that town for the manufacture of certain lines of hardware. In his judgment, the local trade would be sufficient to give such factories a good business. There is need, he also says, of a good merchant iron mill, the local demand being sufficient to keep a small mill going the year round, and the scrap now shipped from there being sufficient to supply such a mill in that line. There is room also for bolt works, malleable works, stove foundry, woodenware works, and other similar industries. These, in his judgment, would be well sustained, as there is a large local demand and opportunities for surrounding trade.

Machinists' Supplies and Iron.

NEW YORK, August 28, 1884.

There has been no material change in the condition of the supply trade since we last commented upon it. Some dealers think there is a slight improvement, while others think there has been none, but all are hopeful of the fall prospects.

Iron—The market for pig continues dull, with more sellers than buyers. Efforts are still being made to close down the furnaces for a short time, but it is doubtful if those interested in this movement will succeed. Sales are almost entirely confined to jobbing lots, No. 1 X Foundry being nominally quoted at $19.50 to $20; No. 2 X $18 to $18.50; Grey Forge $16 to $17.

Copper—The market for ingot has ruled dull and nominal. Sellers still ask 14c. for Lake, but buyers do not pay more than 13¾c., while other brands rule from 13c. to 13¼c.

Tin—The demand for pig is slow, without change of price. Banca, 20½c.; Straits and Malacca 18¼c. to 18½c.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Pattern-maker and draughtsman desires situation. References given. Address A. B., AM. MACHINIST.

A mechanical draughtsman, with many years' experience, desires a position. Box 4, AM. MACHINIST

Mech. draughtsman wants position. Specialty, steam engine work. Address Box 98, Westville, Ct.

Situation wanted—Machinist, lathe, or vise hand. References given. W. M. Dakin, 73 S. Oxford street, Brooklyn, L. I.

A young man, aged twenty-six, wants a situation, where five years' shop and 2 years' office experience would be useful. References. Address J. I. V., Box 160, So. Bethlehem, Pa.

Wanted, for the Pacific Coast—A skilled manager in a machine business, must have successful experience and be not less than 35 years old. Address, giving experience and references, "Pacific," AM. MACHINIST.

First-class mechanical engineer and draughtsman, with extensive experience as designer, superintendent, and salesman, is open to an engagement. Steam engineering a specialty. Best of references. Address "M. 100," AM. MACHINIST.

Wanted—Situation as foreman or superintendent, by a practical foundryman of twenty years' experience. Thoroughly understands the business in all its branches. Capable of figuring from plans, making estimates, etc., on all classes of iron work. Best of references as to ability and character. Address "Foundryman," AM. MACHINIST.

Small yacht and horizontal engine castings. Send stamp for price-list. J. L. Lucas, Waterbury, Conn.

Wanted—Parties traveling and selling to steam users, or dealing in mill supplies, to take the agency of a good and fast-selling article. Good inducements offered. Address "Manufacturer," care of AM. MACHINIST.

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One No. 1 Gang Drill, 4 spindle, 2 spindles geared.
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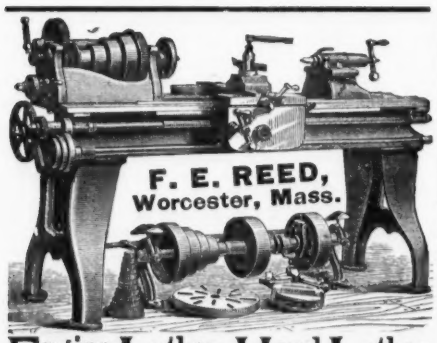

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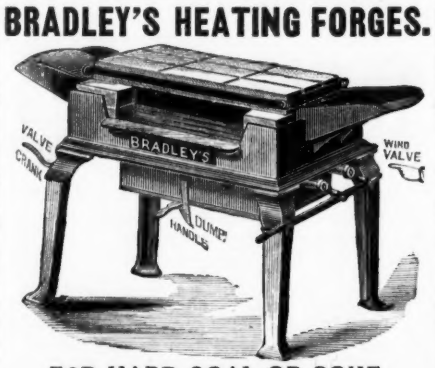

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INDISPENSABLE IN ALL SHOPS to keep **Bradley's Cushioned Hammers** and men fully employed, and reduce cost of production.
BRADLEY & CO., Syracuse, N. Y.
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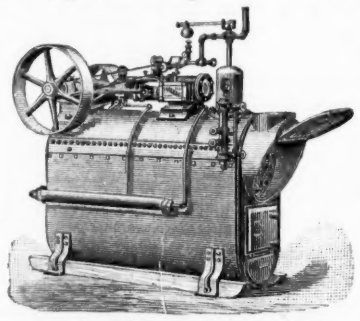

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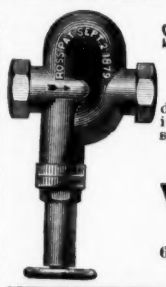
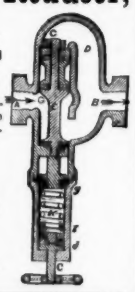


Automatically reduces the pressure in pipes to any desired extent.



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Tables of the principal speeds occurring in mechanical engineering, expressed in mètres in a second. By P. Keerayeff. Translated by Sergius Kern. Price, 20 cents. Descriptive catalogue of books, 100 pages, free.

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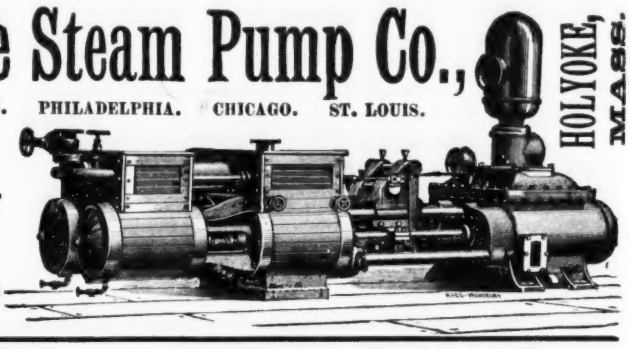

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MACHINIST TOOLS
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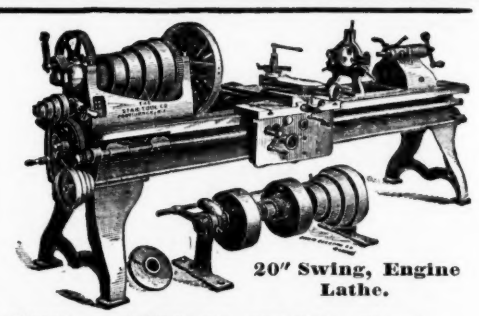

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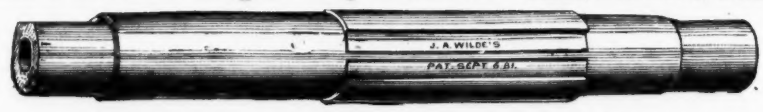

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Sole Agents and Dealers in General Machinery and Supplies.
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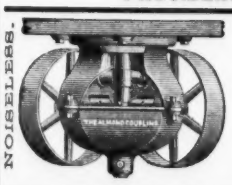

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A new quarter turn motion to replace quarter turn belts and bevel gears.
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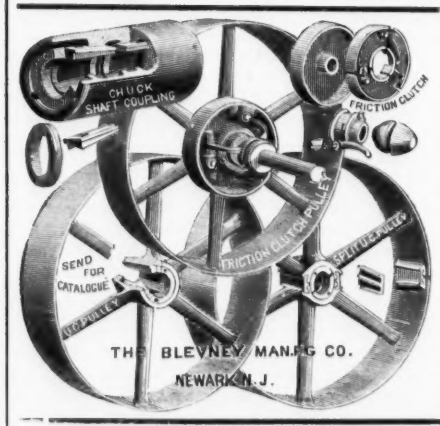

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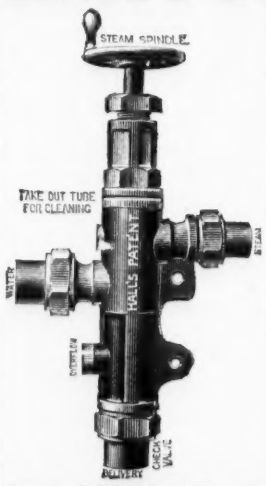

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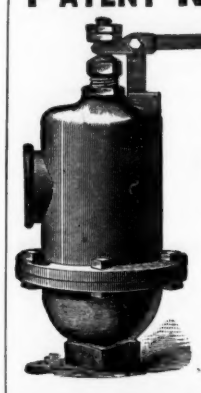

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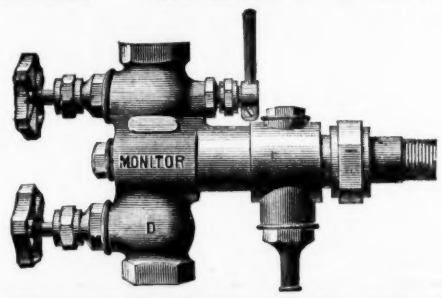

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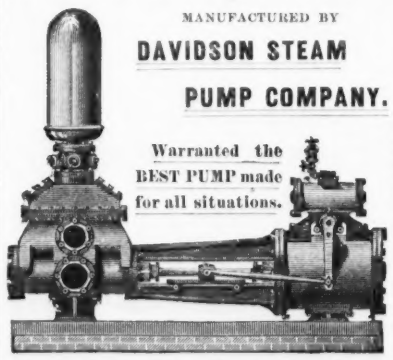

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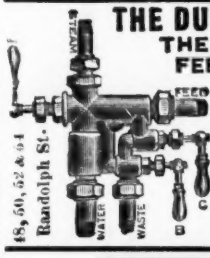

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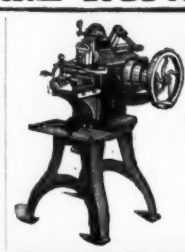

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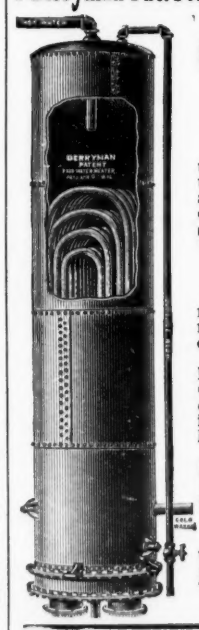

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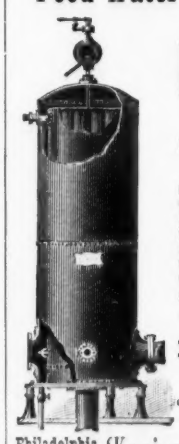

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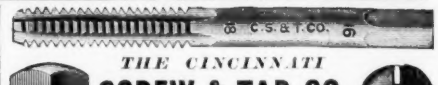

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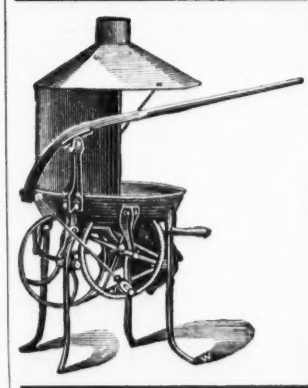

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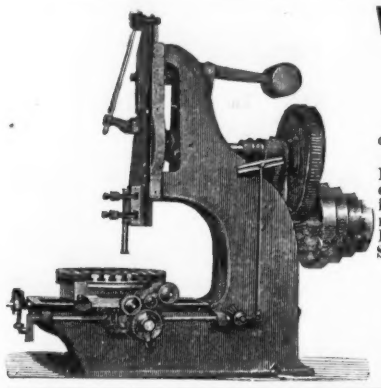

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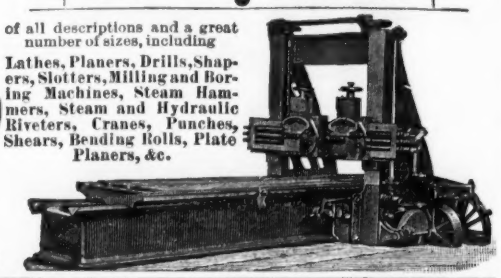

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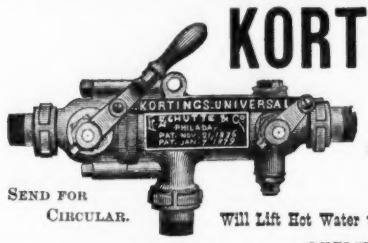

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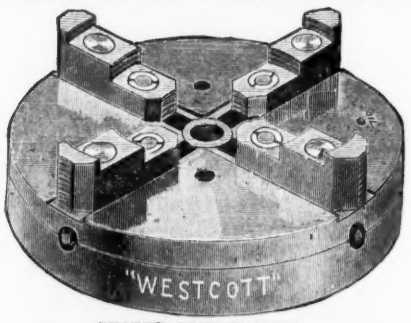

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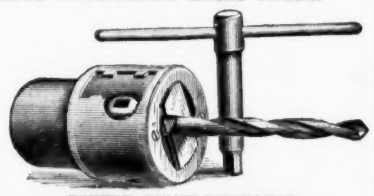

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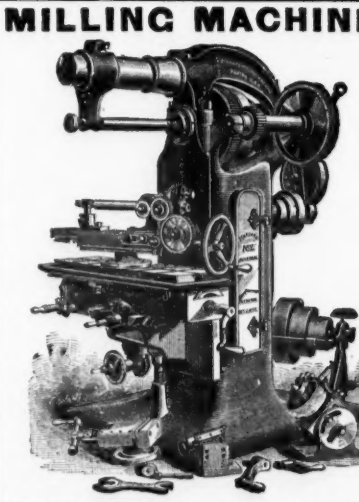

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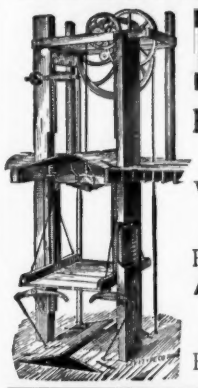

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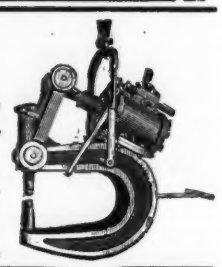

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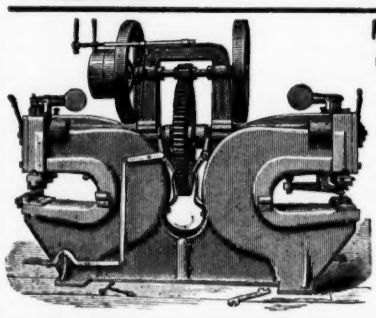

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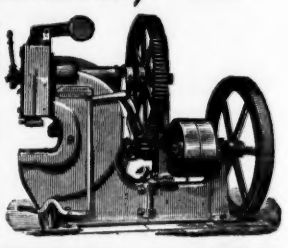

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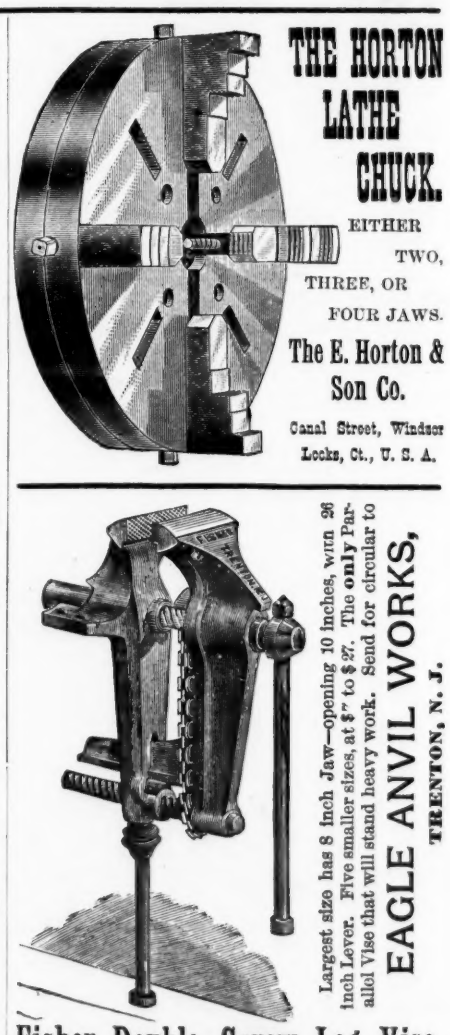

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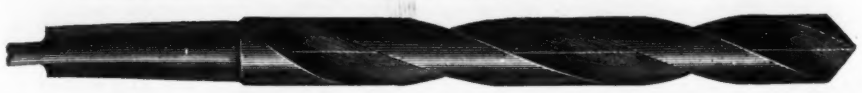

SOLID AND SHELL REAMERS, BEACH'S PATENT SELF-CENTERING CHUCK, BIT STOCK DRILLS.

Drills for Coes, Worcester, Hunter and other Hand Drill Presses. Drill Grinding Machines, Center and Adjustable Drill Chucks, Taper Reamers, Milling Cutters, and Special Tools to order.

All Tools Exact to Whitworth Standard Gauges.

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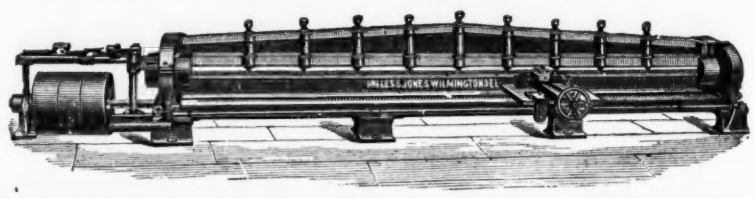
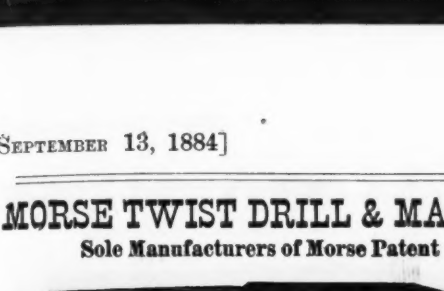
BOILER PLATE PLANER.

Will Plane any Length of Plate.



Tools cut both ways and have independent adjustment. Table acts as a gauge for setting the Plate. Driven by a Steel Screw, which is supported its entire length so that it cannot be bent or sprung.

HILLES & JONES, Wilmington, Del.



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SUPPLIED BY GREEN AND SHAW

Patent Tube and Gang Well System,

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Rollstone Lathe with improvements on Waymoth Lathes, and Pattern Makers' Lathes.

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Valley Machine Co.'s Pump.

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MACHINERY, METALS, ETC.,
115, 117 MAGAZINE STREET,
NEW ORLEANS, Feb. 7th, 1876.

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Yours respectfully B. J. WEST.

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MINERS AND SHIPPERS OF
FLUOR SPAR,
Furnished in any quantity. EVANSVILLE, IND.

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STRIKES A BLOW WITH
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A NEW MOVEMENT! SEND FOR DESCRIPTION.
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Manufacturers of INSTRUMENTS for Use on
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Write for Particulars to 95 & 97 Oliver Street, Boston, Mass.

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CROSBY STEAM ENGINE INDICATOR.
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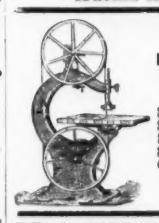

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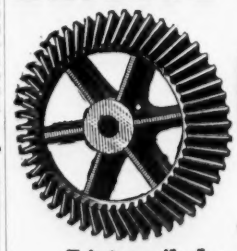

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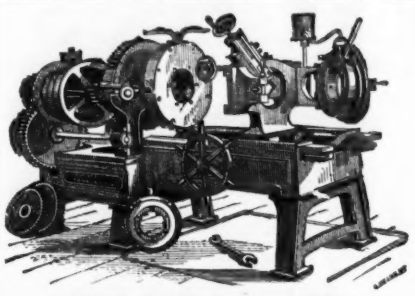

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For Pipe, Mill and Steam Fitters' Use.
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For Steam Fitting, also
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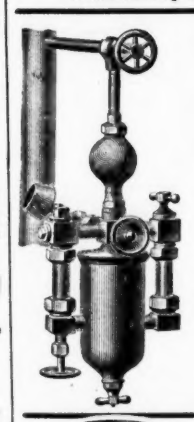
14" ENGINE LATHES OF NEW DESIGN
guaranteed to be equal in material, design and workmanship to the best ever offered.



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TOOLS for Emery Wheel Grinding, Metal and Wood Polishing and Horse and Cattle Brushing and Clipping.

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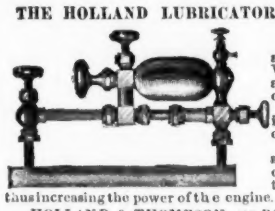

Is guaranteed to be
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2. It will pay for itself in 6 month's in saving of oil, coal, and packing.
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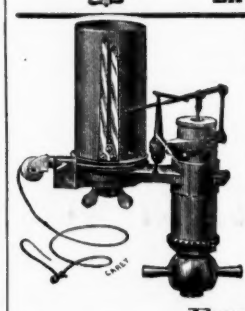

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Office of E. P. ALLIS & CO.,
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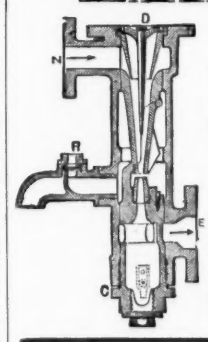

Worked by Exhaust Steam Alone.

Takes the place of Feed Pump, Heater, and by Condensing the Exhaust Steam removes the back pressure. Utilizes a power heretofore thrown away. Works automatically at a steam pressure of less than half a pound. Adapted to all pressures. For Locomotives as well as Stationary Engines.

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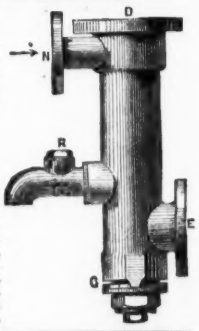

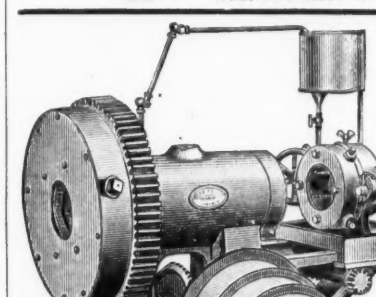

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Have sufficient Pipe-Work about your Mill, Factory or Shops to make a Powerful, Convenient, and very Compact

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Soon pay for itself?

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Further think it might pay you to write us for particulars of the "ECLIPSE" MACHINES, for which we claim many desirable features, including Moderate Prices. We build the "Eclipse" for both Hand and Power use. Mention this Paper and address,

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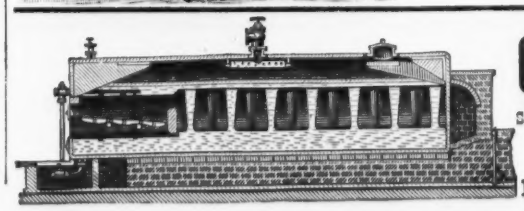

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Safety—Economy in Fuel—Low Cost of Maintenance—Dry Steam without Superheating.

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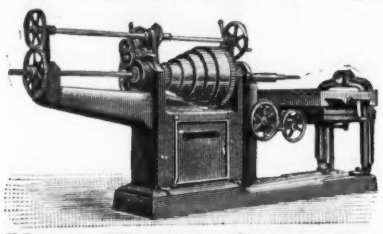

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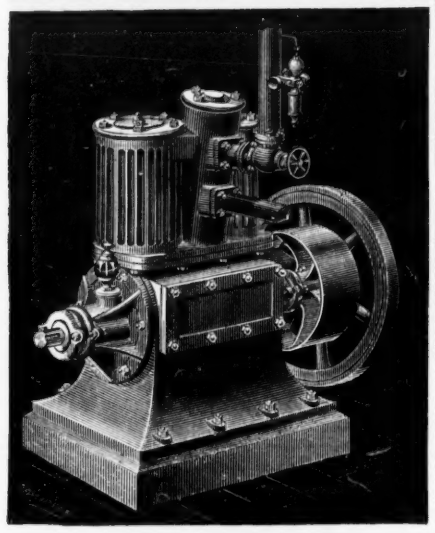

Rear view, showing one wheel removed.

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4 TO 400 HORSE POWER.

900 ENGINES
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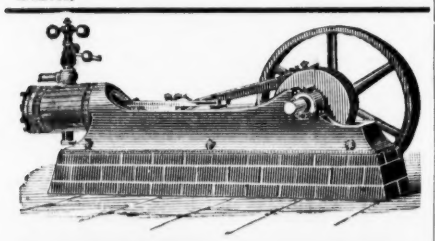

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for all purposes from 25 to 40 Horse-power together with any style of boiler preferred. This Engine is fitted with heavy counterbalanced Crank and Automatic Stop Governor.

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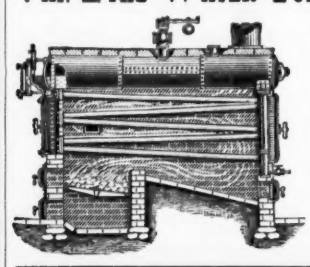

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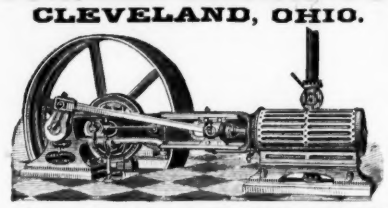

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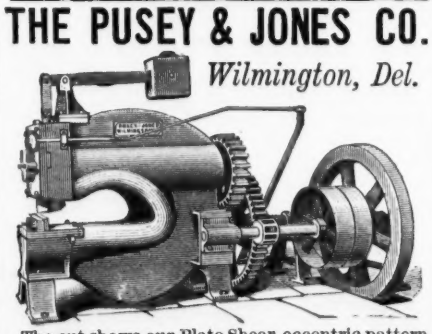

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Boilers, Tanks, Machinery for Rolling Mills, Punches, Shears, Riveters, Angle Iron Cutters, Cranes and heavy Iron Work generally.

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guaranteed to excavate 50 per cent. more material from hard bottom than any other machine.

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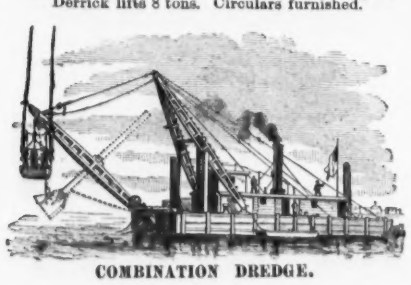
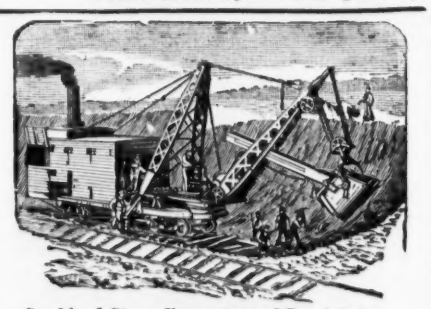


COMBINATION DREDGE.



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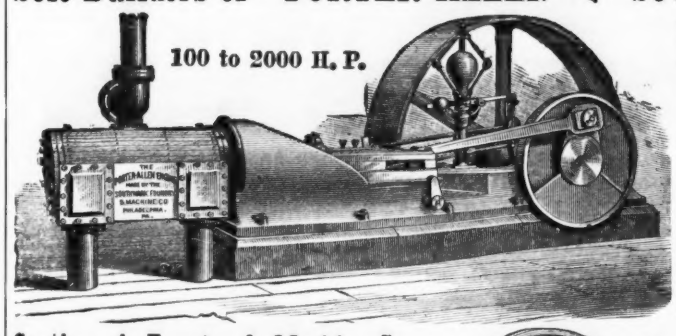

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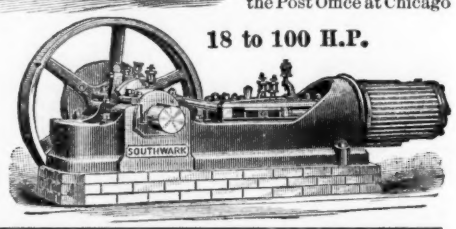
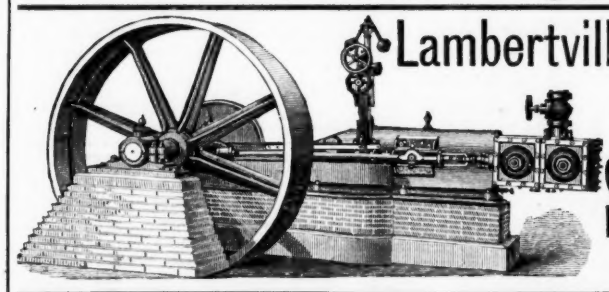


18 to 100 H.P.



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Manufacturers of
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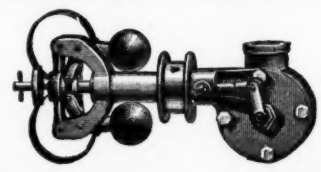
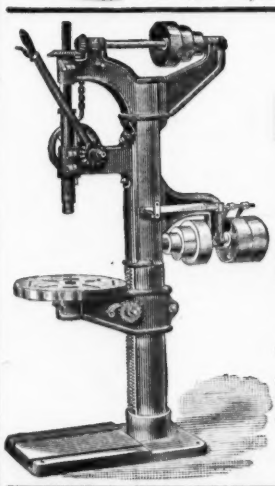


WATER WHEEL GOVERNORS.



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Teeth cut diagonally, Grips Round Iron or Pipe.

PATENTED AUGUST 31, 1875.

Falcon Wrench.

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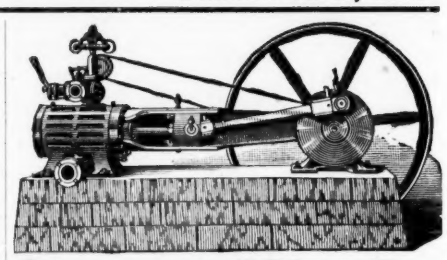

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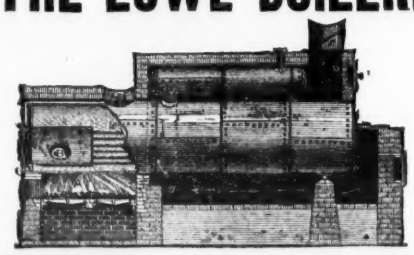

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MANUFACTURER OF

The Lowe Boiler, which eight years' use of the steam superheating drum style, and sixteen of the Lowe Boiler, under all conditions, has proved to be the most satisfactory boiler known in all respects. Gives dry steam. The process for combustion of the gases is in the construction and setting. Burns any fuel and gets as much result from it as any boiler or setting at no more cost, with greater durability. Send for descriptive circular.

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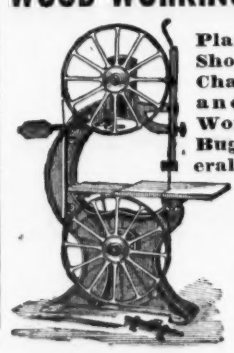

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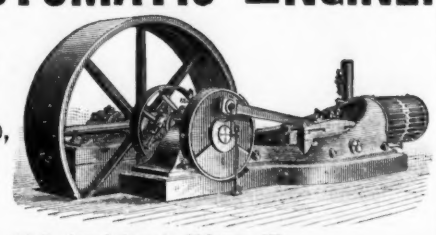

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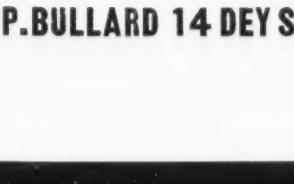

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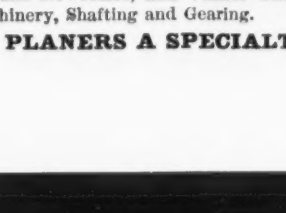

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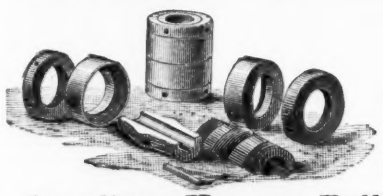

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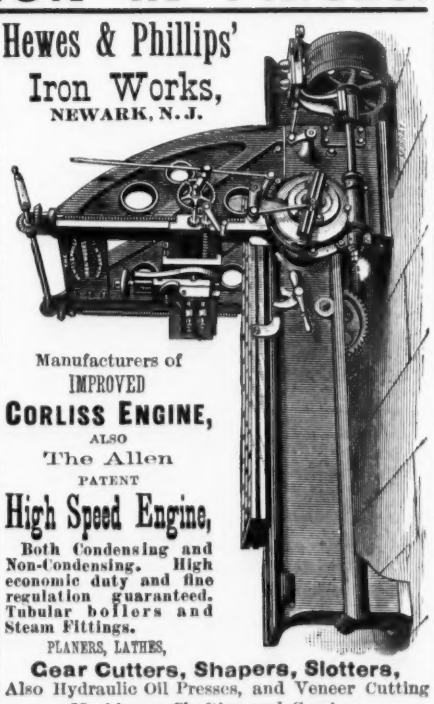

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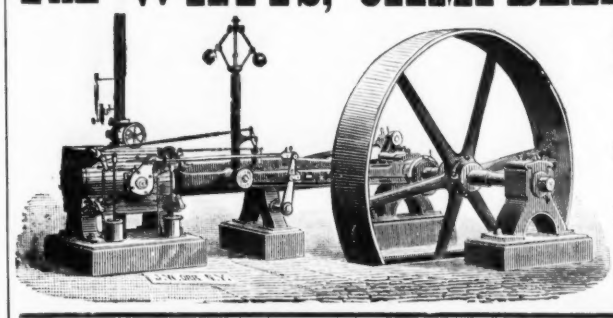

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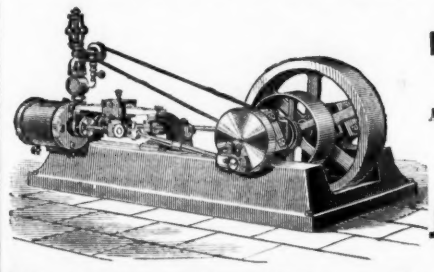

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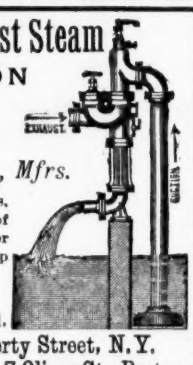

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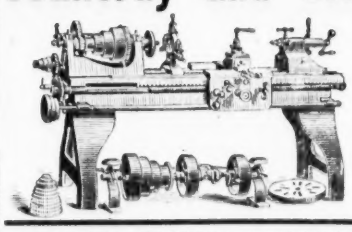

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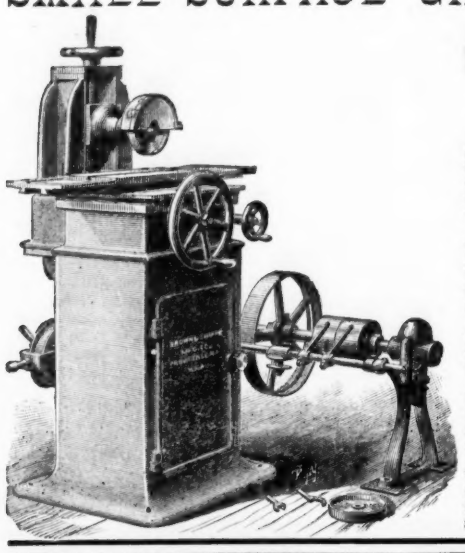

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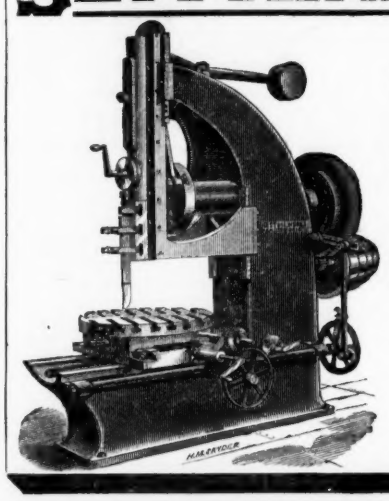

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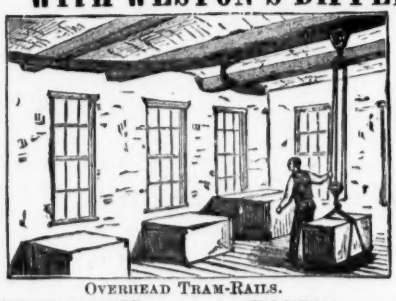

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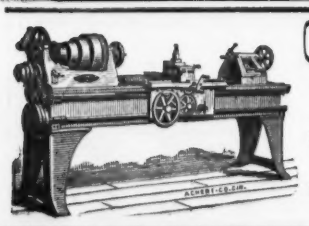

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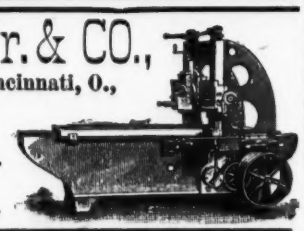

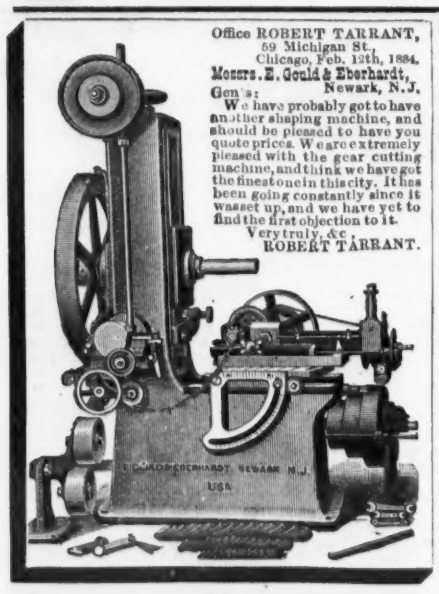

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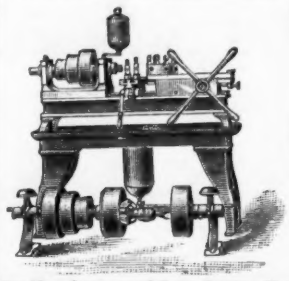

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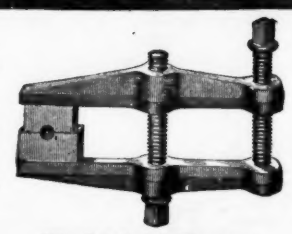

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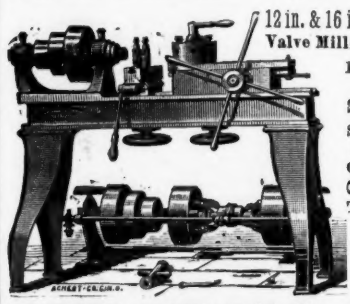

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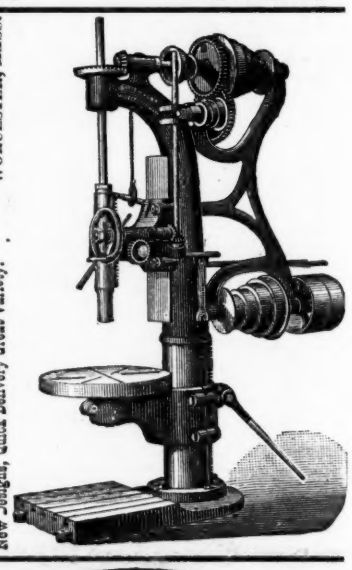

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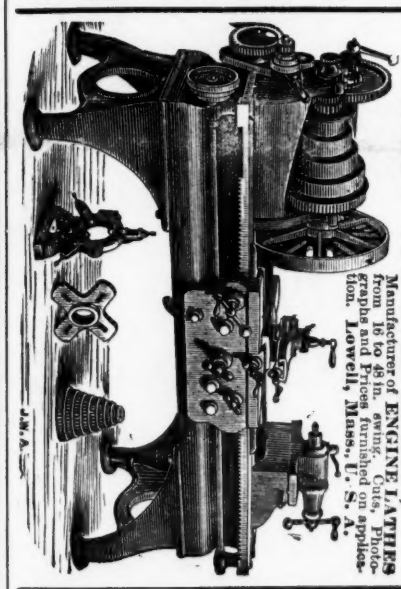

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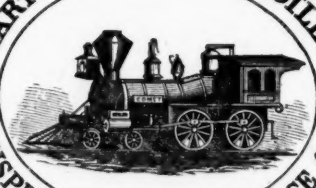

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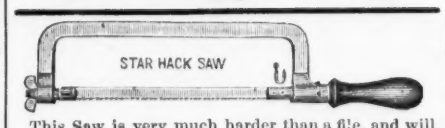

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This Saw is very much harder than a file, and will cut Iron and Steel almost as readily as wood. One saw will cut off a bar of half-inch round iron eighty times, or a bar of untempered steel forty times. It cuts ten times as fast as a file, and at one-tenth the cost. As it cuts everything, it will do most of the sawing required about a house, shop or farm.

The Frame is made of Steel, polished and Nickel Plated, and will face the saw in four different directions. Frame and 12 Saws sent by mail on receipt of $1.50. Hardware dealers will furnish them at the same price. All genuine goods are marked with a Star, and bear our name—

Millers Falls Co.,

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GEAR WHEELS AND GEAR CUTTING

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GEORGE B. GRANT,
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Dies and other Tools for the manufacture of all kinds of SHEET METAL GOODS, Drop Forgings, &c.

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We have the following NEW and SECOND-HAND TOOLS for immediate delivery or on short notice.

NEW.

Engine Lathes, Screw-Cutting—Three 26 in. Swing, 10, 12 and 14 ft. bed; four 24 in. Swing, 10 to 20 ft. bed; six 19 in. Swing, 6 to 12 ft. bed; six 15 in. x 6 ft. Fox Turret Lathes; six 16 in. x 6 ft. Fox Turret Lathes; six 14 in. x 5 ft. Hand-Speed Lathes; six 13 in. x 5 ft. Plain Turret Lathes; three 19 in. x 6 ft. Turret Chucking Lathes.

The above are all our own make.

SECOND-HAND.

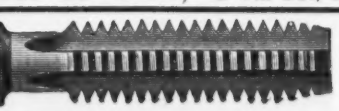
Engine Lathes, Screw-Cutting—Three 18 in. Swing, 8 ft. bed, Lodge, Barker; two 16 in. Swing, 6 ft. bed, Ames & Perkins; one 12 in Swing, 5 ft. bed, Read; one 15 in. Swing, 5 ft. bed, B. G. Turret Lathe, Lodge, Barker.

Shapers—One 18 in. Stroke, Prentiss; one 15 in. Stroke, Hendey.

Planers—One 24 in. x 24 in. x 6 ft., Hendey; one 22 in. x 22 in. x 5 ft., Powell.

LODGE, BARKER & CO., N. W. CORNER EGGLESTON AVE. & 6th ST., CINCINNATI, OHIO.

J. M. CARPENTER
PAWTUCKET, R. I.



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